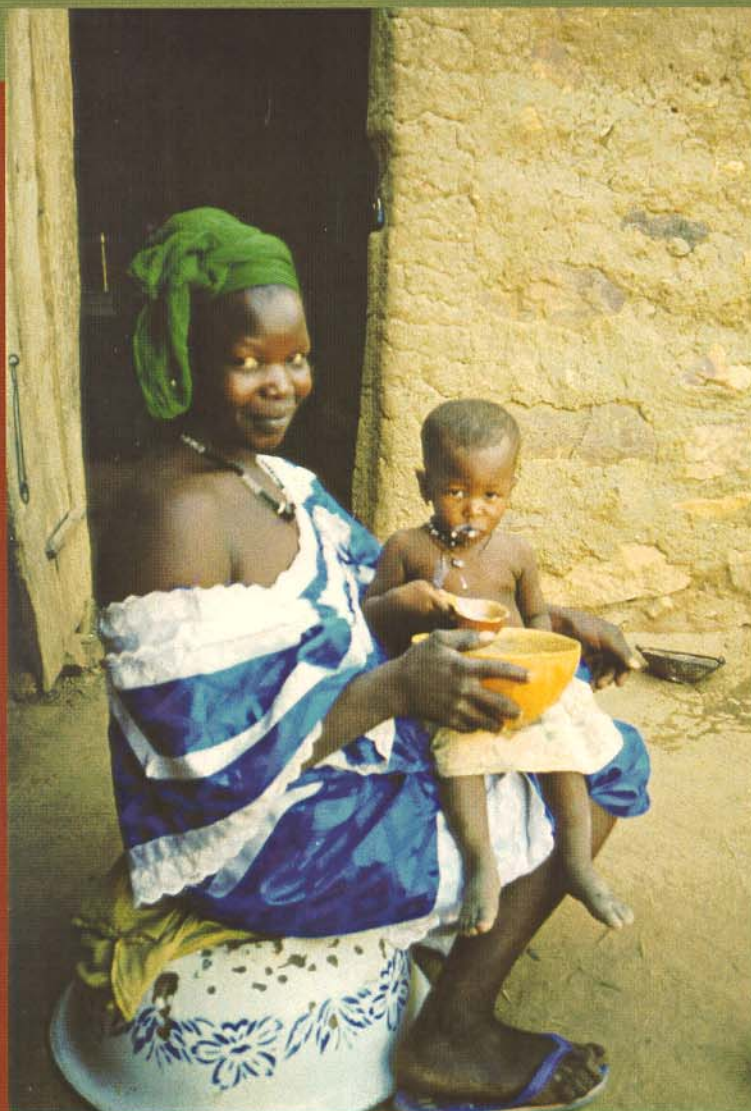


INTRODUCING COMPLEMENTARY FOODS TO INFANTS IN CENTRAL MALI



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**Sarah Castle
P. Stanley Yoder
Mamadou Kani Konaté**

**ORC Macro
Calverton, Maryland USA**

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ORC Macro
11785 Beltsville Drive,
Suite 300
Calverton, MD 20705 USA
Telephone: 301-572-0200
Fax: 301-572-0999
E-mail: reports@macroint.com

Authors:

Sarah Castle and Mamadou Kani Konaté are independent consultants with Marikani and Castle Consultants Ltd. P. Stanley Yoder is a qualitative research specialist with ORC Macro.

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PREFACE

The authors would like to thank the authorities of the four fieldwork sites of the Mopti Region for their assistance and collaboration in the research. We are extremely grateful to the mothers and others who gave so generously of their time to be observed and answer questions about themselves and their children. Finally, we thank Altrena Mukuria, nutrition specialist at ORC Macro, for overseeing the funding process and for her careful reading of the text and her suggestions for clarification. This research was funded by the USAID Bureau for Africa Office of Sustainable Development's Health and Human Resources Analysis for Africa Project (HHRAA) under contract #HRN-C-00-97-00019-00. The opinions expressed are those of the authors, and do not necessarily reflect the views of USAID.

SUMMARY

INTRODUCTION

This study of the complementary feeding of infants age 3-12 months was undertaken to improve the understanding and interpretation of certain findings on the nutritional status of children in Mali from the Demographic and Health Survey (DHS) of 1995-1996. Most nutritionists agree that children need solid food in addition to breast milk when they are 4-6 months of age in order to reach their full growth potential. However, the 1995-1996 survey in Mali found that only half of mothers reported giving solid foods to their children 6-9 months old, that few children were exclusively breastfed, and that most were given water or other liquids from birth. The study presented here seeks to understand how and when the process of initiating food supplementation occurs, as mothers begin to give their infants either solid or mushy food in addition to breast milk.

Fieldwork for this study was conducted in central Mali in the Mopti Region, where the main ethnic groups comprise the Fulani (Peulh) and the Dogon. The former are cattle herders practicing agropastoralism, while the latter cultivate millet in their remote, mountainous villages. This region of Mali is an area of high prevalence of children with wasting and stunting. According to the 1995-1996 DHS survey, in the Mopti Region, 27 percent of children under three were wasted, 28 percent were stunted, and 41 percent were underweight.

The study was organized around the following research questions:

- At what age do mothers give complementary foods/liquids and why do they do it?
- What types of solids and liquids do they give to their children in addition to breast milk?
- What are the signs that a mother interprets as a child requiring complementary food?
- How do mothers manage feeding during episodes of illness?

Formulating the research questions in this manner assumes that the interaction between a mother (or other caretaker) and an infant has an impact on the child's nutritional status. That is, it assumes that although the more general problems of food security and social or economic status may have some effect, they by themselves do not determine nutritional status.

METHODS

The study questions point to the need for evidence about specific interactions, or individual behavior, and about how people go about feeding their children. The methods of data collection used were extended in-depth interviews with mothers, structured observations of the mother-child or caretaker-child interaction, several group discussions, and collection of anthropometric data on children. The data were collected at four sites, two urban and two rural. The urban sites were neighborhoods in the towns of Mopti and Ségou, while the rural sites were Synda, a Dogon village near Douentza, and Boré, a village largely of Bambara people. For the rural sites, all the households were enumerated and all the children 3-12 months old were weighed and measured. For the urban sites, every other household was enumerated and the children were weighed and measured.

The most appropriate approach to examining whether the mother-child interaction influences a child's nutritional status involves working with mothers of children with contrasting nutritional outcomes. The use of "contrast" samples comprising extremes of this type provides useful

information about cases. Thus, using height-for-age (stunting) as a measure of nutritional status, the ten children with the highest Z-scores and the ten with the lowest Z-scores were identified at each site. Mothers of those children composed the original sample (N=80) for the individual interviews. The four highest-scoring and four lowest-scoring children were also identified for observation.

The individual interviews were conducted by interviewers trained to ask open-ended questions about the topics of interest. A total of 76 interviews were conducted. In addition, discussions were held at one urban and one rural site with a group of adolescent girls, fathers, and grandmothers to assess their knowledge of and experience with caring for young children. The observations took place during three two-hour periods in one day: from 8:00 AM to 10:00 AM, from 12:00 PM to 2:00 PM, and from 4:00 PM to 6:00 PM. Using an index with markers indicating what both the mother (or other caretaker) and the child was doing each minute, the observers followed the mother-child interactions. In all, 31 pairs were observed for six hours during one day.

FINDINGS

Breastfeeding

Women had positive views of breastfeeding and saw it as a cheap, nutritious way of nourishing their children while encouraging health and growth. However, some mothers cited other benefits of breastfeeding besides those associated with nutrition. In particular, they noted that it quieted their infants and thus enabled them to get on with their household tasks.

Most mothers offered breastfeeding on demand, usually in response to the child's crying. However, two mothers of malnourished children indicated that they sometimes did not breastfeed on demand because their work did not permit them to do so. Thus, the study hypothesis that mothers of well-nourished children respond more often to their infants' crying than mothers of malnourished infants do is supported by this evidence.

All the children were observed breastfeeding during the observation periods. Among both well-nourished and malnourished children, there were differences in the time spent breastfeeding per day for each of the age groups: 3-4 months, 5-6 months, and 7 months or more. In the 3-4 month group, well-nourished children breastfed on average for 19 minutes more than their malnourished counterparts. However, among those age seven months or more, those who were well nourished breastfed on average for 10 minutes less than their malnourished counterparts.

In short, younger children of better nutritional status spend more of the early months breastfeeding but then appear to reduce breast milk consumption to take in additional liquids and solids by at least six months of age. Those who are malnourished seem to breastfeed less in the early months but more during the later months, compared with their well-nourished peers.

Complementary feeding

The study assumed that community and household food security was such that food availability would not be a problem. It became clear that in many cases, poverty and food shortages were everyday realities for some families and influenced infant feeding practices. Many women talked about how difficult it was for them to feed their children anything but millet gruel. Thus, the assumption about food security was not supported by the study. It may well be that the malnourished children came from families facing the most severe food shortages.

All children received water, and most received traditional medicines, from an early age. Indeed, not one infant was truly exclusively breastfed, although many of the younger infants did not receive “food” until they were six months old. In general, children were receiving *cobal* (millet gruel) at about six months. The rationale given for offering *cobal* is that breast milk by itself will no longer satisfy the child. At about 9-10 months, infants were given rice or *to*, a thick millet paste eaten with a sauce of dried baobab leaves. However, a few children in the rural areas reached 11-12 months of age existing on *cobal*, breast milk, and traditional medicines.

Among Fulani communities in central Mali, *cobal* is a watery millet-based gruel often drunk with soured milk. Adults frequently drink *cobal* after eating their staple, *to*. For children, *cobal* is a bridging liquid appropriate for infants about six months old and a liquid that fills the gap in cases of perceived milk insufficiency. Mothers speak of *cobal* as light and sweet rather than heavy. Mothers do not consider *cobal* a “food.”

The data show very little difference in infant feeding between urban and rural children. However, in urban areas, the malnourished children received a greater variety of foods and liquids than those who exhibited better nutritional outcomes did.

Among children who became ill and who were already receiving complementary foods before their illness, eight mothers of well-nourished children made their children a special dish to aid their recovery. Only one mother of a malnourished child did so. Generally, and not only when their children were sick, mothers of malnourished infants did not encourage them to eat if the children did not want to.

The direct observations involved following infants and their caretakers for a six-hour period. The observations are presented in the form of the number of minutes or the percentage of time the child or mother was observed in a specific activity. Regression analyzes were carried out to test for statistical differences. Virtually no differences were found by observations in the type of feeding experienced by well-nourished and malnourished children. However, differences were found in terms of the care they received, in the type of surrogate caretakers employed, and in the social support available to their mother.

Caring for infants

The study results show that mothers sometimes called on their own older daughters, their sisters, their cowives, or their mother-in-law to assist them with child care or other household chores. Infant feeding and other aspects of child care are fundamentally linked to the social context in which they occur. Mothers with weak social ties or low social support may have difficulties in fulfilling their multiple roles as mothers, daughters-in-law, and spouses. The lack of practical and emotional support available to the mothers of malnourished children in particular emerged from the in-depth interviews in this study.

The study found that the mother-in-law plays a critical role in child care when present in her son's household. In particular, young and first-time mothers rarely made decisions on their own about any aspect of their children's well-being. Mothers-in-law took responsibility for much of the day-to-day care of the child, for giving traditional medicines, treating illnesses, and advising on feeding in general.

General

The study found very few systematic differences in the mother-child interactions between mothers of well-nourished and malnourished children. Several contrasts between the two groups did emerge, however. Judging from how often and how strongly the subject was raised, it seems clear that the mothers of well-nourished children placed a much stronger emphasis on hygiene and cleanliness than those of malnourished children. In the same vein, the mothers of malnourished children placed a greater emphasis on the role of traditional medicines and benedictions in ensuring a child's good health.

Mothers of malnourished children tended to give complementary food earlier than mothers of well-nourished children. If mothers noticed that their breast milk was insufficient or that the quality of the milk was inferior, they would give other foods. This reaction set up a cycle of breast milk insufficiency as the frequency and intensity of infant suckling was diminished by the child's consumption of complementary foods.

Cobal was used to introduce children to solid food. However, the nutritive quality of *cobal* is minimal unless it contains soured milk. Health education messages should emphasize the positive aspects of complementing at six months of age with *cobal* and reinforcing its energy content by adding groundnut oil or pounded groundnuts.

Regarding illness management, mothers tended to increase breastfeeding and giving water during illness episodes. Mothers of better-nourished children paid more attention to food consumption if the child was sick, and they were more likely to prepare special dishes or to insist that a child eat even when he or she did not apparently wish to do so. Mothers of malnourished children expressed the view that if a child did not want to eat, there was no point in forcing him or her.

It is the social context of the feeding practices and the decisions preceding them rather than the practices themselves that differ among the two groups of mothers and their children. The community context is one of absolute and extreme poverty in which time and labor demands on women are excessive and result in very little income. Men recognize that their responsibilities are to feed and cloth their immediate and often extended families, but they have great difficulty in doing so. Women admitted that despite advice from health workers to diversify complementary foods, they were unable to do so for economic reasons.

One of the major determinants of mothers' ability to care for and monitor their children is the social support available to them in their household, particularly older daughters who can act as child minders. Those women who could not draw on daughters to provide child care for their infants or to help with other household tasks were obliged to combine child care and domestic duties and carry out both simultaneously. It is likely that this practice leads to increased fatigue and serves to limit their ability to interact with their children.

CONCLUSIONS

Mothers' infant feeding practices were different from the standards recommended by international agencies in two main ways: virtually all mothers gave infants water daily soon after birth, and a certain portion of mothers did not begin complementary feeding until the child was 9 or 10 months old. The interaction of these factors in this economically marginal environment

characterized by food insecurity means that vulnerable infants easily run the risk of becoming malnourished, which often spirals into a constant cycle of illness, anorexia, and compromised growth.

This study did not discover evidence of sharp contrasts in the mother-child interactions between mothers of well-nourished versus malnourished infants as originally expected. On the other hand, differences in the social and economic context of households appear to affect nutritional status of infants. Mothers who had older daughters to assist in child care were more likely to have well-nourished infants than those who did not.

The contrast between mothers who have caretakers available and those who do not underscores the importance of supportive social networks in caring for infants. This finding suggests that interventions to increase nutritional status of children that seek to change the behavior of individual mothers without changing the social context of the household are not likely to succeed. The interaction between mother and child can change if the social and economic contexts permit such changes.

POLICY RECOMMENDATIONS

- Health workers should be taught about the recommendations on exclusive breastfeeding and on the correct age for giving complementary foods, including water and traditional medicines. They also need to be trained to advise women to continue and even increase breastfeeding if their milk appears to be insufficient because milk production is related to the frequency and intensity of infant suckling.
- Because of their key role in child care with young mothers, older women (mothers-in-law) should be integrated into child health education programs, which often focus only on women of reproductive age. They could be sensitively educated by using “griots” (praise-singers) or other traditional methods of communication that emphasize their positive role and provide information about complementary foods.
- Opportunities for the development of women’s social support and social networks should be increased to provide them with opportunities for social interaction, economic collaboration, and child care. Recent migrants in urban areas could be linked to others from their place of origin through the “Associations des Ressortissants.” Neighborhood associations could be involved in setting up child care services for those who live in the same neighborhood.
- Since the main weaning food (*cobal*) is so widely given as a complementary food, it could be usefully fortified, perhaps with peanut oil or ground peanuts, to increase its energy content.
- The association between good hygiene in the household and well-nourished status suggests that ways should be found to improve environmental sanitation around the household.

INTRODUCTION

1.1 PURPOSE AND CONTEXT OF THE STUDY

This study of the complementary feeding of infants age 3-12 months was undertaken to improve the understanding of how mothers and other caretakers in central Mali introduce young children to food other than breast milk. Most nutritionists agree that children need solid food in addition to breast milk when they are age 4-6 months in order to reach their full growth potential (Brown, Dewey, and Allen, 1998; Koniz-Booher et al., 1991; Martines, Rea, and DeZoysa, 1992). The 1995-1996 Demographic and Health Survey (DHS) for Mali found that only half of the mothers reported giving solid foods to their children age 6-9 months (Coulibaly et al., 1996). However, in the same survey, few children were exclusively breastfed and most were given water or other liquids from birth. These other liquids are likely to be sources of contamination and lead to a risk of diarrhea and ultimately to growth faltering.

The DHS survey found that children grow at nearly normal rates until they reach six months when they begin falling far behind international standards. The evidence suggests that there may well be a relationship between the consumption of complementary foods and the nutritional status of young children. The study presented here seeks to understand the reasons for late addition of solid or mushy food and the very early supplementation with other liquids and to address the context of maternal decisions on infant feeding.

1.2 ISSUES IN THE STUDY OF INFANT FEEDING IN MALI

Although we acknowledge the broader issues of deprivation, poverty, and powerlessness that compromise food security in many of the communities involved in this study, our interest is in infant feeding and, in particular, in practices of complementary feeding. As described, the focus is on two specific practices:

1. *Delaying giving complementary food until after six months.*

The Demographic and Health Survey indicated that a very high proportion of infants six months old or more received no solid foods in addition to breast milk. For example, nearly 40 percent of children age 8-9 months and 21 percent of those age 10-11 months received nothing but breast milk and water despite international recommendations advocating beginning infant feeding at 4-6 months.

2. *Giving liquids under six months of age*

The Demographic and Health Survey indicated that even in the first month of life, nearly one-fifth of infants were receiving other liquids in addition to breast milk and water. This proportion increased to 23 percent among children age 2-3 months and to 30 percent among children age 4-5 months.

It should be noted that according to the DHS survey and the research presented here, giving complementary food (including traditional medicines) before 4-6 months (Practice 2) was more common than delaying it until 9-12 months (Practice 1).

Malnutrition among children endures in much of the developing world despite numerous efforts to improve the nutritional status of mothers and children. In reviewing data from 1980 to 1992, the World Health Organization found that more than one-third of children less than five years old in developing countries have height-for-age scores more than two standard deviations below the median of reference populations (Brown, Dewey, and Allen, 1998). The proportion of children with poor nutritional status has changed little or not at all in the past 20 years.

Public health and medical specialists understand fairly well the debilitating effects of malnutrition on young children: stunted growth, impaired cognitive functioning, increased vulnerability to disease, and greater risk of death (Nicoll, 2000; Pollitt, 2000). Research has found malnutrition to be one of the five most common causes of death among children less than five years old in developing countries, along with malaria, measles, diarrhea, and acute respiratory infections (Gernaat, Dechering, and Voorhoeve, 1998; Vardas, Blaauw, and McAnerney, 1999).

2.1 INTERNATIONAL RECOMMENDATIONS ON BREASTFEEDING AND COMPLEMENTARY FEEDING

International consensus indicates that complementing breast milk (*even with water*) during the first six months of a child's life is unnecessary and may even increase the risk of diarrhea as extra solids and liquids are often contaminated (Almroth and Bidinger, 1990; Popkin et al., 1990; Martines, Rea, and DeZoysa, 1992). In addition, children who receive liquid or solid foods in the very early months may spend less time breastfeeding and suckle less intensively so that the mothers' breasts are less stimulated to produce milk. Earlier complementary feeding has been associated with an earlier age at weaning in many cultural settings (Martines, Rea, and DeZoysa, 1992). Thus, guidelines drawn up by pediatricians recommend exclusive breastfeeding for the first four to six months of the child's life. After that, it is recommended that low-cost, locally available weaning foods gradually be introduced (Koniz-Booher et al., 1991).

The recommendations do not usually consider liquids regularly given as medicines or for ritual purposes as complementary food. If such liquids are not "food," then the definition of complementary feeding is ambiguous. Giving traditional medicines (often with butter from cows' milk or from the shea nut) daily was virtually universal and often constituted the only substance consumed in addition to breast milk among some children over six months of age. Thus, for the purposes of this report, we have included traditional medicines as supplements because they probably comprise a source of energy, albeit limited, for the children concerned.

2.2 INTERNATIONAL RECOMMENDATIONS ON DIARRHEAL DISEASE MANAGEMENT

The Health and Communications Division of the World Health Organization (WHO) provides the following advice for mothers of sick children who are nursing:

- Breastfeed more often.
- If your child has started eating other foods, offer food more often, in small amounts, and give plenty to drink.

It will be shown below that mothers' management of diarrheal disease was generally appropriate in terms of continuing breastfeeding and increasing the giving of water. However, children were rarely encouraged to eat when ill, nor given extra food.

2.3 MEASURING MALNUTRITION

The three indicators used to assess nutritional status are height-for-age (stunting), weight-for-height (wasting), and weight-for-age (underweight). Children are considered malnourished if they are more than two standard deviations below the median of the U.S. National Center for Health Statistics (NCHS) reference population by one of these criteria. Stunting results from inadequate food intake over a long period and/or repeated episodes of illness. Wasting reflects recent shortage of food and/or current acute illness.

Being underweight is a composite indicator that may reflect either chronic or acute low food consumption, or both. It is often used as a general indicator of health status. Children with Z-scores between two and three standard deviations below the median are considered moderately malnourished, while those below three standard deviations are severely malnourished (Haggerty et al., 1998).

Evidence of the range and degree of malnutrition among young children in most Saharan Africa can be derived from the Demographic and Health Surveys conducted in 23 countries from 1992 through 1998. In these countries, the percentage of children less than three years old who were malnourished by being underweight varied between a low of 16 percent in Zimbabwe to a high of 50 percent in Niger, with most countries falling between 22 and 35 percent. About one-fourth or more of these children were severely underweight.

In these surveys, the percentage of stunted children varied from 20 percent in Ghana to 48 percent in Madagascar, with the majority of countries situated between 22 percent and 38 percent. In 12 of the 23 countries, one-third or more of the children less than three years old were stunted. The proportion of children who are stunted increases dramatically for children age 10-21 months, often from less than 10 percent to as high as 40 percent. For West African countries, the prevalence of stunting begins increasing from 10 to 15 percent at about six months of age and peaks at over 50 percent at 21 months. Since height-for-age assessments reflect chronic rather than acute malnutrition, we consider stunting to be a more revealing measure of nutritional status than wasting or being underweight.

2.4 CAUSES OF MALNUTRITION

The causes of malnutrition are multiple and include poor socioeconomic conditions, inadequate prenatal care, maternal malnutrition, short spacing between births, high fertility, large numbers of young children, ignorance about feeding, repeated infections, and lack of access to health services. Malnutrition has been noted as an underlying cause of 40 to 50 percent of all under-five deaths in West Africa, with the likelihood of mortality doubling with each lower category of nutritional status (Ghosh, 1990). It has been estimated that more than 80 percent of deaths associated with malnutrition involved mild or moderate malnutrition (Pelletier, Frongillo, and Habicht, 1993). Thus, understanding the causes and context of malnutrition will lead to improved child survival and better child health outcomes.

UNICEF (1999) distinguishes between basic causes of malnutrition related to the resources available at the level of society, the underlying causes at the household level, and the immediate causes, which are inadequate food consumption and infectious disease. Food intake may be inadequate in quantity or quality, while illness reduces appetite and the ability to absorb nutrients. Causes of malnutrition at the household level include low level of access to food, inadequate child care practices, and poor water and sanitation.

Risk factors related to the health of the mother and child found to be associated with the nutritional status of the child include the low birth weight of the child, the incidence of illness in the child, and malnutrition in the mother. In a case-control study of malnutrition among young children in Accra, Ghana, Rikimaru et al. (1998) found that low birth weight was an important risk factor for the prevalence of underweight and severe malnutrition (stunting) and that lack of education in the mother was also a risk factor.

Increased maternal education has often been reported to have a positive association with the nutritional status of young children. Scholars have debated whether the association indicates a causal relationship or whether education is really a marker for unmeasured variables. Some studies have found evidence that the effect of maternal education on nutritional status differs according to the level of household income. Doan (1988) found that in Jordan, maternal education is associated with better nutritional status in households of average resources but not in those with high and low levels of income.

Another of Doan's findings relevant to this study relates to a mother's social status. Doan concluded that a mother's low social power in her household and, in particular, her coresidence with her mother-in-law, had a negative association with children's nutritional status even when controlling for education. Reed, Habicht, and Niameogo (1996) found that in Benin, maternal education was associated with better nutrition only in the middle income households, had no effect in the poorer ones, and was associated with poorer nutrition in the richer households. This last finding was thought to be related to the fact that women with higher education tend to work outside the home and make more use of surrogate caregivers. Ruel and colleagues (1992) found that in Lesotho, the importance of the effect of education varied with socioeconomic status.

The analysis of factors associated with nutritional status provides information about the overall picture without demonstrating causal relationships. Because of what is known about growth and biological phenomena, the effects of low birth weight and of illness on nutritional status seem evident. However, little is known about what other factors play a role in determining the nutritional status of a young child. Does the mother's social network play a role? What about the behavior or actions of the child? How might we characterize the interaction between mother and child, and how critical is this interaction? Researchers who use the concept of "failure to thrive" have stated that malnutrition should be viewed as the result of problematic interaction between mother and child rather than a problem in the child or in the environment (Wright and Birks, 2000).

Answers to such questions are not likely to come from large sample surveys, but rather from smaller-scale studies that include extensive observations and the collection of data about the interaction between a child and a caretaker. Yet studies that examine how young children are actually fed at home or the social interactions that determine what a child eats are relatively rare. An exception is a study conducted in rural Tchad that examined the relationship between stunting (height-for-age) and psychosocial characteristics of caregivers. Although maternal height and caregiver workload were not significant predictors of stunting, caregiver autonomy and satisfaction with life, as well as family social support, influenced child height-for-age independently of household socioeconomic factors (Bégin, Frongillo, and Delisle, 1998).

NUTRITIONAL STATUS OF CHILDREN IN MALI

3.1 NUTRITIONAL DATA FROM THE DHS SURVEY

The last Demographic and Health Survey (EDS - Mali 1995-1996) showed that a high percentage of children age 3-36 months were malnourished. In particular, a high percentage of children were two or three standard deviations below the NCHS median weight-for-height and weight-for-age during their first year of life. More than 5 percent of children age 6-11 months were less than minus three standard deviations below the NCHS median height-for-age, while 13.7 percent were less than two standard deviations below it.

Although deficiencies in height-for-age are more likely to affect older children, their precursors are evident in the younger age groups who are already likely to be wasted or underweight. Thus, it is necessary to examine feeding practices among the youngest infants in order to assess risks among the older age groups.

The survey found a marked difference in the nutritional status of children in the capital city (Bamako) and in rural and urban areas, but very little difference among regions. Only 17 percent of the children in Bamako suffered from chronic malnutrition, contrasting with 32 percent for the rest of the country. The percentages from all urban and rural areas were 22 percent for urban areas and 33 percent for rural areas. However, Bamako had the highest rate (28 percent) of acute malnutrition (wasting), compared with 25 percent for all the rural areas. However, when all urban areas are combined and compared with all rural areas, no difference appears (24 percent versus 23 percent).

3.2 BREASTFEEDING PRACTICES IN MALI

Throughout Mali, breastfeeding is prolonged and usually on demand. Table 1 from the Demographic and Health Survey (1995-1996) indicates that supplementation usually occurs early in the child's life and before the age recommended by WHO (4-6 months), UNICEF (6 months), and USAID (6 months). At 4-6 months of age, 97 percent of children were receiving something in addition to breast milk. However, these data are based on 24-hour recall, which has been found to underestimate true consumption.¹

Age in months	Breast milk only	Formula	Other milk	Other liquids	Meat, fish, eggs	Flour, cereals	Tubers, plantains	Other	Number of children
0-1	18.7	2.3	3.4	15.4	0.8	1.7	0.8	0.5	285
2-3	7.2	3.3	5.9	17.1	0.6	2.2	0	0.6	381
4-6	2.8	4.0	9.8	21.4	3.2	9.9	4.1	4.1	571
7-9	2.2	5.7	14.0	33.8	17.3	33.3	13.0	13.0	484

Source: Mali Demographic and Health Survey 1995-1996

¹ For example, Ferguson and colleagues (1993) conducted a study of the validity of the 24-hour recall method in Ghana by using the recall method as well as weighing all foods consumed. They found that the recall method missed a major proportion of the snacks consumed and underreported the quantity of the main staple food eaten.

Table 2 shows that there was very little difference in the overall duration of breastfeeding between rural and urban areas and between regions. In all areas, it lasted on average slightly less than two years. The table shows that exclusive breastfeeding did not even occur for a full month in any of the regions.

Table 2: Median duration (in months) of breastfeeding by residence and region		
Residence and region	Median duration of breastfeeding	Median duration of exclusive breastfeeding
Residence		
Bamako	20.3	0.4
Other cities	20.8	0.5
All urban areas	20.6	0.5
Rural areas	22.2	0.5
Region		
Kayes	21.7	0.4
Koulikoro	22.0	0.4
Sikasso	23.4	0.5
Segou	20.6	0.5
Mopti	22.1	0.5
Timbouctou/Gao (urban)	19.7	0.4
Bamako	20.3	0.4
Source: Mali Demographic and Health Survey 1995-1996		

Qualitative or anthropological studies of infant feeding in Mali are rare. However, one study in the inner Niger Delta found, as occurs elsewhere in Mali, that breastfeeding occurred on demand (Marriott, 1998). Ethnicity had no significant effect on breastfeeding and feeding practices. Stronger influences comprised access to additional foods or conflict in time allocation between labor and child care. Importantly, the study does suggest that heterogeneity in nursing patterns may come from differences in dietary practices. However, it was found that both groups (Bozo and Fulbe) in the study generally have lengthy periods of breastfeeding if the early giving of traditional medicines is not counted as complementary feeding.

Retrospective data from this study show a mean duration of exclusive breastfeeding of 10.6 months for Bozo women (n=34) and 10.3 for Fulani (Peulh) women (n=38). The mean age of children who have diets supplemented by solids was 18.6 months. However, liquids such as milk or gruel and traditional medicines are likely to have been given earlier. In a separate analysis of the same population, the author concludes that a decrease in suckling due to feeding solids may be offset by an increase in suckling due to the infant demanding the breast for physical affection (Marriott, 1998).

A third study by LeGrand and Mbacke (1993) reports on urban breastfeeding practices in Bamako, Mali. Median age at the introduction of foods (both porridge and solids) was 7 months, and the median age for weaning was 19 months. In general, although the mother's age did not affect timing of initiating complementary feeding, it did affect the timing of weaning. Children born to mothers at age 25 or younger were weaned earlier, and those born to mothers 40 years old or older were weaned later. Furthermore, the study found no significant differences in feeding behavior of first births and children of birth orders 2-5, although women of higher parity (who obviously were older) tend to wean later. Better-educated women and households of a higher economic status generally started complementary feeding and weaning earlier than others.

3.3 CULTURAL CONTEXT OF BREASTFEEDING AND COMPLEMENTARY FEEDING

In a two-year study of primarily Bambara and Mandinka women in periurban Bamako, breastfeeding was found to be practiced by all women, with nursing on demand (Dettwyler, 1986, 1987). Infants were nursed for comfort as well as nutrition. Weaning took place at an average age of 20.8 months. During the first few days of life, infants received water, which mothers believed should be given until the skin color changed from a lighter to a more permanent darker color. Regarding specific beliefs about breastfeeding, the Bambara people believe that breast milk is best for infants because it makes the child strong and healthy. They also believe that babies were stronger in the old days when they were fed until the age of 3-4 years and that bottle-fed infants were weaker.

At the same time, these mothers believe that formula makes a child tall but only breast milk makes a child strong, healthy, and heavy. Breast milk can be of various qualities, and if the milk is bad, the child is thin. Women see breast milk as a product from the woman's blood that serves not just as nutrition but consolidates social and lineage ties. Breast milk substitutes are not widely used, with only 15 out of 136 children (11 percent) in the study ever having received a breast milk substitute. Age was not the only factor for weaning; there is a widespread understanding that mothers should wean when they become pregnant because the stomach of a pregnant woman is said to produce a heat that will make the breastfeeding child sick. This understanding is widespread throughout Mali and constitutes the primary reason for weaning (Castle, 1992).

Other fundamental understandings about infant feeding were identified by Dettwyler (1986) and have also been reported elsewhere in Mali and repeated by the mothers interviewed here. These include the notion that first, if a child is hungry, he will eat, and if he does not want to eat, he should not be forced to eat; and second, only the child knows when he or she is hungry and when he or she is full. These understandings have important implications for the feeding of sickly or anorexic children who may have poor appetites.

In the neighborhoods where fieldwork took place, the research found that foods, food groups, or certain liquids often have a specific purpose. For example, Fulani people often distinguish between foods for growth, health, or recuperation after an illness. Although the staple meal is *to*, it is usually followed by drinking *cobal* from a calabash. *Cobal*, a light gruel made with millet and usually consumed with soured milk, often has a sprinkling of hot pepper and sugar. *Cobal* is drunk without pausing until the person feels full. Water is taken after a meal, not during, because it is believed to diminish appetite. Fresh milk is available in greater quantities during the rainy season when the cattle are better nourished. It is thought to cause fever and diarrhea in small children if not boiled, which may indicate a certain lactose intolerance in certain communities.

Last, there is a widespread practice of giving traditional medicines to small children "to clean the dirtiness out of the stomach," to encourage growth, and to prevent diarrhea. The most widespread of these is *ngouhoumi* (Peulh) or *quinqueliba* (Bambara) (*combretum micranthum*) (Latin), which has been shown pharmacologically to have antipyretic properties and is widely consumed by adults and children alike (ACCT, 1985). *Quinqueliba* is usually collected in the form of leaves and twigs, which are boiled. It may be given orally to the child from birth until approximately age five and is mixed with animal butter or the butter from the shea nut. Among the Dogon, it is usually given to infants by enema, whereby the mother takes some of the liquid in her mouth and blows it up the child's anus. This causes the child to defecate instantly and enables the mother to continue her household chores without having to worry about cleaning up after the child.

Among the communities involved in the study, previous research indicated that there is a very strongly held idea that if one has a certain food (such as tea, sugar, or milk) over a prolonged period and then the food is withdrawn or unavailable, the person will become sick with a headache or diarrhea. It is thought best not to try new or “different” foods in case the person gets used to them and then they suddenly become unavailable (Castle, 1992). This conviction emerges strongly from the findings presented here and is likely to have implications for education programs that encourage mothers to diversify weaning or complementary foods.

3.4 SOCIOECONOMIC SETTING

One of the largest countries in West Africa, Mali is also one of the oldest Islamic nations in sub-Saharan Africa. Essentially, Malians are rural people who live in herding, farming, and fishing communities. Young people migrate seasonally in search of work but return to their village for the cultivation season from July to November.

The 1970s and 1980s were disastrous years for Mali because of a drought. After the application of the structural adjustment programs of the World Bank, unemployment soared and the education and health service systems were weakened. In the early 1990s, United Nations indicators placed Mali among the five poorest countries in the world with a per capita income at US \$270, life expectancy at 45 years, literacy at 16 percent, and health services reaching barely 15 percent of the population. The rural populations were finding it harder and harder to survive. After a change in government in 1991, the country became democratic and earned widespread acclaim for its transparency and openness. At present, Mali is heavily dependent on foreign exchange through the production and export of cotton.

The Bambara people who comprise one-third of the population dominate southern Mali and make a living from growing cotton and cereals. In central Mali where the study took place, the main ethnic groups are the Fulani (Peulh) and the Dogon. The former are cattle herders practising agropastoralism, whilst the latter cultivate millet in their remote, mountainous villages. Other groups, such as the Tamasheq and the Songhai, inhabit the central and northern regions.

3.5 HOUSEHOLD FOOD SECURITY

Household food production in Mali is typical of systems found throughout the Sahel where much of the food comes from a communal family farm plus fields that are individually cultivated by family members. The family lands are usually the most fertile and closest to the household. The household head usually assigns responsibility for cultivation tasks to household members: wives, other relatives, and adolescent children.

Cash crops such as cotton and major cereals are sometimes cultivated on the family land. Other areas of family land may be allocated for the cultivation of condiments and vegetables to accompany the grains. The labor allocated to the cultivation of the family fields takes priority.

In return, household members receive grain (usually millet) for themselves and their dependents during the year. In addition, the household head also assigns small areas of private fields to other household members. The fields cultivated individually are generally located in marginal lands of poorer quality. Some families may have additional gardens where they cultivate onions, henna, peanuts, and hibiscus for sale in local markets. Hence, the household head organizes the family members as an integrated production unit balancing subsistence and commercial cultivation (Sanders, Shapiro, and Ramaswamy, 1996).

3.6 WOMEN'S ACTIVITIES

Access to land is still to a certain extent regulated by indigenous systems of land tenure. Most societies in Mali are patrilineal, and a male household head usually manages the family land. Upon his death, management passes to the male heir who is usually the deceased person's younger brother or son. Although sex segregation and the division of labor by gender is respected, women have always had access to agricultural resources and negotiating power (Koenig, Diarra, and Sow, 1998). Women rarely own or inherit fields, but women have the right to cultivate fields for themselves without actual ownership.

Women are responsible for assisting with communal household production although they may have their own field where they grow a staple crop such as millet or maize. Alternatively, women may use their land to provide the other ingredients to accompany grains since their fields are smaller. Some of this produce is sold at the market, and the rest is used for household consumption. If a woman does not have a field, then her husband provides money to buy what is necessary for food and other expenses. In general, women can choose to do whatever they want with money from the sale of crops or condiments in their fields (Koenig, Diarra, and Sow, 1998).

Among the Fulani, women's economic activities center on selling milk. A husband will give his wife fresh milk in the evening. She can choose to sell it, use it in the family *cobal* (gruel), or give it to her children. She usually sours most of it overnight and every other day sells it from door to door in her own or nearby villages. How much she needs to sell may depend on the economic status of her family; wealthier women choose to reserve more of it for their own children (Castle, 1992; Buhl, 1999).

Besides tending to their fields, women have daily domestic responsibilities, such as cooking, fetching water, and finding wood, that take up a lot of time. Although domestic tasks are divided among female members in a polygamous household or extended family, the successful execution of those tasks depends greatly on the women's access to labor and the availability of social support. Finding child care depends on social support from other members of the family. When a woman has a daughter-in-law, she is no longer required to cook and has greater control over her own labor.

Older women in good health are often productive farmers and become valuable household members. Very few female-headed households exist in rural Mali, however, since divorced women are remarried rapidly, and other unattached women are easily absorbed into existing male-headed households.

RESEARCH QUESTIONS AND HYPOTHESES

- The study is organized around the following research questions:
- At what age do mothers give supplementary foods/liquids and why do they do it?
- What types of solids and liquids do they give to their children in addition to breast milk?
- What are the signs that a mother interprets as a child requiring supplementary food?
- How do mothers manage feeding during episodes of illness?

The study used a “contrast sample” (Bernard, 1995) for interviewing and observing mothers of children at the opposite ends of a ranking according to nutritional status. This is derived from methodologies coming out of the “Positive Deviance” literature (Zeitlin et al., 1990), which seeks to explain how some children can thrive when the majority are malnourished, and how some children come to be exceptionally malnourished compared with community norms. The study chose to employ direct questioning and observation since research indicates that mothers’ recall of infant food consumption over a 24-hour period may be inaccurate.

4.1 HYPOTHESES

The study hypotheses were the following and focused on the best-nourished and worst-nourished children in each community as well as their mothers:

- Mothers of well-nourished children interact with them more intensively than do mothers of malnourished children.
- Children who are looked after by surrogate caretakers are more likely to be malnourished.
- Mothers of well-nourished children react to their infants’ cries by breastfeeding more frequently than mothers of malnourished children.
- Mothers of children who have a better nutritional status breastfeed for longer periods than mothers of malnourished children.

4.2 STUDY SITES

The three study sites were located in the Mopti Region of central Mali (see map page 14). The rural sites were chosen because the principal investigators had already had some contact with these communities and had been warmly received by them. The urban sites were chosen to represent typical areas of the towns of Mopti and Searé. In these expanding urban areas, two types of immigrants predominate: landless and impoverished former rural inhabitants who seek better circumstances and educated government employees sent to Mopti under the new decentralization policy of the current government. Both of these groups differ from the typical long-term residents. The former rural residents may exhibit risky behaviors and characteristics predisposing their children to malnutrition, whilst the civil servants have higher levels of education and income than average. Higher education may be associated with children being better nourished. To gain a more typical picture of urban feeding practices and child care, the research team chose older, well-established neighborhoods for the study.

MALI



The region of Mopti has one of the highest prevalence rates of children with wasting and stunting according to the 1995-1996 DHS survey. The survey indicates that in the Mopti Region, 27 percent of children under three were wasted, 28 percent were stunted, and 41 percent were underweight compared with 23 percent, 30 percent, and 40 percent, respectively, at the national level.

Rural Site I: Synda

Synda is a small village of approximately 500 people of Dogon ethnic origin, most of whom belong to a subcaste of leather workers. Situated under a rocky outcrop 10 kilometers away from the market town of Douentza, the population relies primarily on millet cultivation in distant fields for subsistence. Women also practice petty trading and spin cotton for use by local weavers and dyers. The village has few resources and is characterized by heavy seasonal out-migration by men and unmarried women.

Rural Site II: Boré

The village of Boré comprises approximately 2,000 people who live in a settlement straddling the tarmac road approximately 100 kilometers north of the regional capital of Mopti. The village of Boré is populated mainly by Bambara people, even though most of the surrounding population is of Fulani origin. Unlike Synda, Boré has a primary school, a dispensary, maternity unit, a weekly market, and comparatively well-developed infrastructure.

Regular labor migration by young men to work in Cotonou, Benin, has brought funds that were used to provide communal financing of a piped water supply and a grinding mill. People appeared to live in nuclear family units rather than in extended family compounds, which is unusual for this region. Cultivation is primarily a male activity with women relying on petty trading for income generation.

Urban Sites: Mopti and Sevaré

The urban sites were the towns of Mopti and Sevaré, which together make up the administrative capital of the Mopti Region with a total population of more than 120,000 people of diverse ethnic origin. Mopti is the older site consisting of densely packed houses on a peninsular downstream of the confluence of the Niger and Bani rivers. Sevaré is a more modern urban conglomeration 12 kilometers away that houses many civil servants posted from Bamako with comparatively high levels of wealth and education. Both towns have lively markets in which many women practice market trading.

The study sought to situate individual behavioral realities in relation to cultural and societal norms about infant feeding. Norms are “what people say they do” or what they say they ought to do, whilst realities refer to “what they actually do” (Randall, 1988). Differentiating norms and realities requires different sets of methodological tools, which, in turn, produce different kinds of data. Accessing information of this kind involves intensive work with individuals and communities and is best accomplished by qualitative techniques. The limited sample size is compensated by the depth and breadth of information collected, although it is recognized that the themes that emerge may not be generalizable to other areas of Mali.

The most appropriate approach involved working with mothers of children with contrasting nutritional outcomes to seek to identify differences in perception and behavior that may be linked to nutritional advantage or disadvantage. Contrast samples (Bernard, 1995) comprising extremes of this type provide useful information about cases that can provide sharp illustrations of motivations behind different care and feeding practices (Myntti, 1993).

Potential biases in this approach, however, need to be recognized. In selecting extreme cases on this basis for intensive fieldwork, interviewers were aware of the child’s nutritional status before interviewing or observing the mother. It is possible that the interviewers’ preconceptions about what they expected to find influenced their own interactions with the mother. For example, those who knew beforehand that they were interviewing mothers of well-nourished children may note and probe for healthy, positive behaviors and ignore detrimental practices. By contrast, those who knew a priori that the child in question was malnourished may focus mainly on inappropriate behaviors and fail to search for positive aspects of child rearing.

5.1 INTERVIEWER TRAINING

The interviewers were chosen because of the principal investigators’ previous collaboration with them or because of personal recommendations about their competence and skills. The team was composed of two men and two women. One of the women was a pediatrician and could thus provide advice to mothers of malnourished children after the survey, which ethically made the study more acceptable. All but one member of the team spoke Fulfulde. Throughout the study, there was a very good team spirit and rapport, which facilitated data collection.

The training occurred over a two-week period in Bamako in October 1999, during which the team members were encouraged to participate actively in the development of the research instruments. Careful attention was paid to training in the measurement of children’s weight and height because any errors in the calculation of the anthropometric indices could have jeopardized the entire study since the children were classified according to their nutritional status.

5.2 RESEARCH INSTRUMENTS AND AVAILABLE DATA

Several methods generating different types of data were used to confirm or reject each of the hypotheses presented above. The number of the hypothesis addressed by each method is noted in parentheses.

Discussion groups (1, 2)

In one rural and one urban setting, a series of discussion groups (somewhat similar to focus groups) were carried out with those who may have influence on children's nutritional status and on mothers' decisionmaking about infant feeding. These groups included adolescent girls who act as caretakers for their infant brothers and sisters and also included older men and grandmothers who may wield substantial social and economic power in their household and thus influence mothers' resources for child health. The discussion groups with the adolescent girls centered on when and why they act as surrogate caretakers for their younger siblings and the kinds of feeding and nonfeeding interactions they engage in with them. The discussions with the older people focused on changes in attitudes and behaviors about infant feeding and their reasons for them. All six discussions were tape-recorded, translated from Bambara or Fulfulde, and written out. The translated texts were entered and analyzed using the Ethnograph computer software.

Household censuses and anthropometric data (2, 4)

In each setting, all eligible households were enumerated and information was taken about the age and sex of each household member. For eligible children, age was verified with a health card where possible. Those children who had been hospitalized in the past six months were excluded from the study because it is thought that their care and treatment was not representative of community-level practices. As children were weighed and measured their weight and height (length) was entered on the form. These data were then entered using ISSA5 software. Although the study presented here only uses data related to height and age, future analyzes will be able to focus on the other anthropometric indices.

In-depth interviews (1, 3)

The in-depth interviews were carried out using a guide with open-ended questions about each subject of interest. The topics covered included details about the woman's marital and familial status, including her satisfaction with her life as a spouse and mother, her views about the quantity and quality of her breast milk, acceptable and appreciated characteristics of food and eating arrangements, cues for feeding and supplementation, appropriate foods for supplementation, infant feeding during illness, and nonfeeding interactions with the child. Interviewers were encouraged to pursue subjects in detail and to follow up pertinent themes as they emerged from the discussion. Each interview lasted approximately one hour. All interviews were tape-recorded in Bambara or Fulfulde, then translated into French and written down. The translations were entered and analyzed using the Ethnograph computer software.

Structured observations (1, 2, 3)

As described, the four children exhibiting the best Z-scores (height-for-age) and the four exhibiting the worst Z-scores (height-for-age) at each site were chosen for structured observations of caretaker-child interactions and feeding and nonfeeding activities. On the form, each minute was used as a unit of observation for the periods of 8-10 AM, 12-2 PM, and 4-6 PM. These periods were selected to coincide with meal consumption or preparation because it was thought that these times would have implications for maternal workloads and infant feeding. However, one woman in Mopti declined to be followed and dropped out of the study, and one only allowed her child to be followed for 330 minutes, leaving blank 30 full observations.²

² This was allowed for in the analyzes, which used a file aggregated to the individual level in which each individual normally contributed 360 minutes of observation time. The number of minutes of the activity of interest observed for this case were thus divided by 330 and multiplied by 360.

The study sought to situate individual behavioral realities in relation to cultural and societal norms about infant feeding. Norms are “what people say they do” or what they say they ought to do, whilst realities refer to “what they actually do” (Randall, 1988). Differentiating norms and realities requires different sets of methodological tools, which, in turn, produce different kinds of data. Accessing information of this kind involves intensive work with individuals and communities and is best accomplished by qualitative techniques. The limited sample size is compensated by the depth and breadth of information collected, although it is recognized that the themes that emerge may not be generalizable to other areas of Mali.

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² This was allowed for in the analyzes, which used a file aggregated to the individual level in which each individual normally contributed 360 minutes of observation time. The number of minutes of the activity of interest observed for this case were thus divided by 330 and multiplied by 360.

For each minute of observation, the child's location was noted, together with the mother's activity (if she was in view); the sex, age, and relationship of surrogate caretakers; the infant's primary activity; and consumption of breast milk and complementary liquids and solids. A section of the form was also available for specific comments about caretaking or feeding practices. The data were entered in SPSS with each minute representing the unit of analysis. Thus, 11,130 units of observation are available for analysis.

5.3 SELECTION BIASES

As Table 3 shows for the urban sites, four women declined to be interviewed, including three mothers of malnourished children. A mother of another malnourished child refused to be observed during her daily activities. Furthermore, an additional mother of an urban malnourished child angrily cut short the observation of her child half an hour before the scheduled end of the interview. We recognize that the methods used are intrusive despite the efforts of the fieldworkers to sensitively explain the study to the women involved. It is possible that mothers of malnourished children recognize that their infants are not thriving and feel a certain degree of shame or embarrassment. The close contact between these women and the fieldworkers may have increased this sense of unease and may have caused them to curtail their involvement in the study. There may therefore be a degree of bias in the results presented here in that a number of the mothers of the most malnourished children are underrepresented in the final results.

5.4 SAMPLE SELECTION

In accord with Malian custom, initial contact in each community was made with the chief and village elders in order to fully explain the aim of the study. Their complete cooperation and full participation greatly facilitated the smooth running of the data collection. Each woman with an eligible child was then contacted, and the nature of the interview and observations was explained to her along with the broader purpose of the research.

The study benefited from the acquisition of newly released figures from the 1998 census of Mali, which listed by *secteur d'énumération*³ the names of household heads and the individuals in each household. These lists were of considerable help in enumerating the population in each site and in identifying women of child-bearing age. Each list was brought up-to-date by consulting the chief and elders in each setting and adding or deleting the names of household heads as appropriate. In Synda and Boré, the entire population of each village was enumerated, and all children age 3-12 months were weighed and measured. As can be seen in Table 3, 36 children of the right age were identified in Synda and 40 were identified in Boré.

In Mopti, the *secteur d'énumération* falling in the urban quarter of Gangal was chosen because it was thought to represent a typical population of the town in terms of socioeconomic status. In Sevaré, the *secteur d'énumération* falling in the urban quarter of Bamako-Coura was chosen for the same reason. In each urban sample, all lists of household heads were updated, and one in two were chosen for enumeration of all individuals in order to identify eligible children.

³ Each *secteur d'énumération* corresponds to approximately 500 people.

Table 3: Sample size and composition by residence and nutritional status								
Number of eligible children	RURAL				URBAN			
	Synda		Boré		Mopti		Sevaré	
	36		40		34		45	
	Well nourished	Mal-nourished	Well nourished	Mal-nourished	Well nourished	Mal-nourished	Well nourished	Mal-nourished
Number of mothers interviewed	10	9	10	10	9	9	10	9
Number of children observed	4	4	4	4	4	3	4	4

Table 3 shows the number of eligible children by study site and the number subsequently weighed, measured, and observed. At each site, all eligible children were weighed and measured, and anthropometric Z-scores for height-for-age were calculated using Epi-Info (version 6.0). The children were then ranked by their Z-scores from best to worst. The mothers of the ten children with the best Z scores were chosen for in-depth interviews along with the mothers of the ten children with the worst Z-scores at each study site. For each of the women selected for an interview, a screening instrument was used to note her age, parity, educational status, and occupation. Subsequently, among these subgroups at each site, the four children with the best height-for-age Z-scores were chosen for observation along with the four children with the worst height-for-age Z-scores.

Information on the nutritional status (height-for-age Z-score) of the sample of children weighed and measured in each setting⁴ indicates that in Synda, the nutritional status was extremely poor: only 6 out of the 32 children had a Z-score of between 0 and 1. Twelve children had Z-scores of minus 2 or below, indicating that they were severely malnourished. In Boré, the situation was not much better despite the comparatively improved economic situation of the village. Eleven of the children had Z-scores of below minus 2, while just 6 out of the 40 had Z-scores between 0 and 2. Little difference was evident between the towns of Mopti and Sevaré although more children were mildly rather than severely malnourished when compared with the rural areas.

5.5 CHARACTERISTICS OF SAMPLE CHILDREN

Table 4 shows the characteristics of the children enrolled in the study. It indicates that a slightly higher percentage of the malnourished children were boys. A significantly higher percentage of those who were malnourished were between 9 and 12 months of age. Importantly, the table also shows that nearly four times the percentage of well-nourished children were below six months of age with the malnourished. By contrast, nearly two-thirds of the malnourished children were age 10-12 months, compared with less than a third of those who were well nourished. Approximately one third of each group was age 6-9 months. The differences in the percentage malnourished by age was statistically significant ($\chi^2=11.39$, $df=2$, $p<0.01$).

⁴ It should be noted that most of the women were illiterate and often found it difficult to recall their child's age. This, combined with interviewer bias, may account for the apparent age-heaping on 12 months evident in the figures.

Table 4: Percent distribution of children by sex and age, according to nutritional status		
Characteristic	Percentage well-nourished children (N=39)	Percentage malnourished children (N=39)
Sex		
Boys	49	64
Girls	51	36
Age		
3-5 months	37	8
6-9 months	34	32
10-12 months	29	61
Total	100	100

5.6 CHARACTERISTICS OF WOMEN INTERVIEWED

Table 5 shows key characteristics of the mothers⁵ of well-nourished and malnourished children. The contrast between mothers less than 25 years old and those more than 35 years old is particularly striking. It also indicates that the majority of malnourished children were those of younger mothers (less than 25 years of age). Finding that the mothers of malnourished children were likely to be young may be due to the increased risk associated with very early age at first birth and with parity one and may also reflect fundamental differences in the household dynamics of the women concerned. It will be shown later that young women often consider themselves inexperienced and rely on the advice of older affines who often take control of their children. Differences in the proportions of well-nourished and malnourished children with a mother below 25 years of age were nearly statistically significant following a Fisher's Exact Test ($p=0.06$).

Most mothers were married although the small number who were divorced, widowed, or single recounted how their status added extra difficulty to their ability to care for their children. More than three times the proportion of well-nourished children had mothers with some schooling, compared with those who were malnourished. This difference is statistically significant (Fisher's Exact Test, $p<0.05$) and reflects trends observed in the Mali DHS survey and elsewhere in Africa (see Section 2.4 above). No differences in the nutritional status of the children were associated with ethnicity.

Nearly half of all mothers of well-nourished children practiced some sort of commerce that presumably enabled them to gain and control their own income. Mothers of malnourished children tended to rely on agricultural production or on their husband's cash to acquire food. These differences were statistically significant (Fisher's Exact Test, $p<0.05$).

⁵ The mother of one child in Mopti was dead and the child was being raised by his maternal grandmother. Her characteristics have been included with those of the other mothers presented in the tables.

Table 5: Percent distribution of women by sociodemographic characteristics, according to nutritional status

Characteristic	Percentage well-nourished women (N=39)	Percentage malnourished women (N=39)
Age		
<25	27	52
25-34	46	41
>35	25	7
Marital status		
Married	95	92
Other	5	8
Formal education		
None	69	90
Some	31	10
Ethnicity		
Peulh	26	31
Dogon	23	28
Other	51	41
Occupation		
Commerce	46	26
Other	54	74
Total	100	100

Table 6 indicates that it is not only the availability of caretakers that seems to be associated with the child's nutritional outcome, but also a mother's social control over the caretaker in question. Even if the mother has at least one older daughter, there seems to be little association with the child's nutritional status. However, if the mother designated the chief babysitter for the child, there appears to be a positive, albeit statistically insignificant, association with the infant's well-being. In these cases, presumably the mother can give orders and directions as to how the child should be looked after.

In the cases in which the main surrogate caretaker was the child's paternal grandmother, a higher percentage of children were malnourished. More than half the malnourished children had their paternal grandmother as their main surrogate caretaker, compared with only 18 percent of the better nourished children ($\chi^2=12.36$, $df=2$, $p<0.01$). Similarly, if the mother-in-law was present in the household (even if she was not cited as the chief surrogate caretaker), a significantly higher percentage of children were malnourished (Fisher's Exact Test, $p<0.05$). Young mothers, more likely to have an elderly babysitter in the household, may not have the experience necessary to properly care for their child.

Household dynamics also appears to be important because having a co-wife with whom the mother can share household tasks and child care responsibilities appears to be positively associated with the child's well-being (although this finding was not quite statistically significant). Thus, a mother's social support and autonomy appear to be key factors in influencing the care and well-being of her child. This theme emerges consistently from the in-depth interviews presented below.

Table 6: Percent distribution of mothers by access to potential caretakers of index child and child's relationship with principal surrogate caretaker, according to nutritional status

Access to potential caretakers	Well nourished (N=39)	Malnourished (N=39)
Number of living daughters of mother		
None	21	28
One or more	79	72
Mother cohabits with mother-in-law		
Yes	31	54
No	69	46
Mother has cowife		
Yes	26	15
No	74	85
Mother reports that main surrogate caretaker is:		
Child's older sister	36	31
Child's grandmother	18	56
Other	26	13
Total	100	100

The results integrate the three types of data collected: translations of in-depth interviews, observations, and focus groups for each theme. The quotations shown below are taken directly from the transcripts and are presented in English. However it must be recognized that the quotes have been through two different translations: Fulfulde to French and French to English. Although great care was taken in the translations, some of the subtleties may be lost since some local concepts and vocabulary are difficult to translate.

The direct observations involved following infants and their caretakers for a six-hour period throughout the day (8-10 AM, 12-2 PM, 4-6 PM). However, a substantial amount of care is given to young children outside these hours, and breastfeeding continues throughout the night. The observations are presented here in the form of the number of minutes or the percentage of time the child or mother was observed in a specific activity. In this approach, each minute becomes a unit, and these values were entered into SPSS. Regression analyzes were carried out to test for statistical differences. It will be shown that virtually no differences were found in the type of feeding experienced by well-nourished and malnourished children. However, differences were found in terms of the care they received, in the type of surrogate caretakers employed, and in the social support available to their mothers.

6.1 HOUSEHOLD FOOD SECURITY

As described earlier, the study assumed that community and household food security was such that food availability would not be a problem. It became clear that in many cases, this assumption was false and abject poverty and food shortages were everyday realities for some families that influenced infant feeding practices.

I haven't given her anything other than water and gruel for the past 24 hours because I don't have the means to offer her anything else.

Mother of a well-nourished, 10-month-old girl, Boré (rural)

I have given her gruel and water (over the past 24 hours). They tell us at the health center to vary infants' complementary food, but we have neither the time nor the means to do so.

Mother of a malnourished 8-month-old girl, Boré (rural)

I come from Gao. We have enormous financial problems. We have nothing left, though he (my husband) sometimes works as a welder. We eat when he brings something back to the house; otherwise, we just stay like this. If I buy 200CFA (\$0.40) worth of fish and 100CFA (\$0.20) of manioc, I can resell it, sometimes with a little profit, sometimes with nothing.

Mother of a malnourished 12-month-old girl, Sevaré (urban)

6.2 VIEWS ON CHILD CARE

When asked about how best to bring up a child, mothers of both groups of children consistently mentioned the need to wash, clothe, and feed the child correctly.

To bring up a child correctly, you have to watch out for his cleanliness and his food and keep him from crying too much.

Mother of a well-nourished 6-month-old boy, Boré (rural)

To best bring up a child, you have to feed him, cure his illnesses, clothe him, and watch out for him a lot.

Mother of a malnourished 9-month-old boy, Mopti (urban)

The mothers of well-nourished children placed a much stronger emphasis on hygiene and cleanliness than those of malnourished children.

So that she is in good health, you have to really follow her feeding closely, giving her fish soup and infant formula, and really watch over her health closely by making sure the conditions are hygienic.

Mother of well-nourished 6-month-old girl, Sevaré (urban)

You have to look after him as well as possible, really make sure that his food is clean and avoid exposing his food to flies.

Mother of well-nourished 11-month-old boy, Synda (rural)

The best way to bring up a child is to make sure that her body is clean and to avoid dirt.

Mother of a well-nourished 8-month-old girl, Sevaré (urban)

The mothers of malnourished children placed a greater emphasis on the role of traditional medicines and benedictions in ensuring a child's good health.

In order to raise a child, you have to feed it, cure it, clothe it, and above all protect it. You have to also give it traditional medicines, which are very effective.

Mother of a malnourished 12-month-old boy, Mopti (urban)

To raise a child, you have to have the means to feed it correctly, cure it, clothe it, and watch over it. In addition, you can go to the marabout (religious cleric) to get the child blessed, or you can wash it with holy water.

Mother of a malnourished 6-month-old girl, Mopti (urban)

Importantly, one young mother of a malnourished child indicated that she did not have such strong views or expectations about child care but left the decisions to her mother-in-law. This theme recurred often during the research.

I can't say much about this because I am a young mother. In our family, my mother-in-law looks after these aspects. Nevertheless, I would say that you have to feed a child, wash him and his clothes, and watch over him a lot.

Mother of malnourished 12-month-old boy, Mopti (urban)

6.3 VIEWS ON BREASTFEEDING

In general, women had extremely positive views on breastfeeding and saw it as a cheap, nutritious way of nourishing their children that encouraged health and growth.

Breastfeeding is a complete food for children here. It gives strength and health to a child.

Mother of a malnourished 8-month-old girl, Boré (rural)

For the moment, this (breastfeeding) is what is important in feeding this child. It is essential for his growth.

Mother of a well-nourished 6-month-old boy, Mopti (urban)

However, some mothers cited other aspects of breastfeeding in addition to those associated with nutrition. In particular, they noted that it quieted their infants and thus enabled them to get on with their household tasks.

There are a lot of benefits of breastfeeding in addition to it being "food." Because the breast has a calming effect, it is like a sleeping pill. In short, it is a medicine.

Mother of a well-nourished 11-month-old girl, Sevaré (urban)

Breastfeeding is really important. The child is well nourished, escapes illnesses, cries rarely, and above all sleeps a lot . . . Breastfeeding permits the child to have strength, stops him from crying, and enables me to get on with my work.

Mother of a well-nourished 10-month-old boy, Synda (rural)

The vast majority of the mothers talked about breastfeeding on demand, usually in response to the child's crying.

I give him the breast every morning when he wakes up and also when he cries because this means that he is hungry.

Mother of a well-nourished 6-month-old boy, Mopti (urban)

I breastfeed when she cries or when she pulls on my top.

Mother of a well-nourished 8-month-old girl, Sevaré (urban)

I breastfeed when he cries or when the last feed has been some time ago.

Mother of a well-nourished 7-month-old boy, Mopti (urban)

However, two mothers of malnourished children indicated that they did not always breastfeed on demand, because their work did not permit them to do so.

I breastfeed when he cries. But when I work, I force myself not to give him the breast, even if he cries for it because it slows me down.

Mother of malnourished 9-month-old boy, Boré (rural)

When I am busy, I just breastfeed when she cries, but if I have nothing to do, I breastfeed whenever I can or when she asks for it.

Mother of a malnourished 12-month-old girl, Sevaré (urban)

We had hypothesized (see section 4.1) that mothers of well-nourished children breastfeed more frequently in response to crying than mothers of malnourished children. Hypothesis 3 appears to have been supported, since the testimonies indicate that mothers of malnourished children may be unwilling to interrupt their work to breastfeed.

6.4 UNDERSTANDING OF MILK INSUFFICIENCY

Two mothers of malnourished children complained of severe milk deficiency and had started to give supplements to their children virtually from birth. One actually sought to decrease the reliance of her 11-month-old child on breast milk. Both women saw their lack of milk as being caused by personal problems. Even the women who did not personally experience milk insufficiency reiterated that worrying and anxiety were the leading causes of milk drying up.

Hunger and worrying (caused by the husband) can cause insufficient milk in a woman. I give gruel to my child so that he is not hungry and so that he breastfeeds less because I don't have enough milk.

Mother of a malnourished 11-month-old boy, Synda (rural)

My child is essentially nourished by gruel because there is no milk in my breasts. When a woman has problems like me, there will not be enough milk because I eat poorly. You can't even talk about the quality of the milk because there is really no milk at all.

Mother of a malnourished 11-month-old boy, Sevaré (urban)

In fact, these women may have been creating a vicious cycle of increased complementary feeding and milk insufficiency since milk production is governed by the frequency and intensity of infant suckling. Increased complementary feeding is likely to decrease stimulation of the breast by the infant and ironically decrease the quantity of maternal milk. This link was recognized by one woman in Sevaré, who, like others, was concerned about the varying quality as well as quantity of breast milk.

If a child consumes other liquids, he breastfeeds less, and this can reduce the quantity of breast milk. However, if the milk is not of good quality, we put a paste made out of millet husks on the breasts for several hours, and this remedies any problems with insufficiency or with the quality. Hunger is the principal factor (behind these problems).

Mother of a well-nourished 7-month-old boy, Sevaré (urban)

Nearly every woman in the study ensured that she had adequate milk by regularly eating cobal.

Here, old women advise us to drink a lot of cobal, which increases the quantity of milk in the breasts.

Mother of a malnourished 7-month-old boy, Boré (rural)

I drink cobal and I swallow butter to have more milk in my breasts.

Mother of a malnourished 3-month-old boy, Synda (rural)

In order to have a lot of milk, you must eat a lot of to and drink a lot of cobal afterwards.

Mother of a well-nourished 10-month-old boy, Synda (rural)

The risk of milk insufficiency was a constant preoccupation of every woman interviewed and a subject about which they had strong ideas. However, no woman was sufficiently malnourished to have a genuine possibility of reduced milk output. It may be, as found elsewhere, that fears of milk insufficiency reflect more general perceptions of scarcity and shortage in these marginal environments (Obermeyer and Castle, 1996).

6.5 VIEWS ON THE AGE FOR INTRODUCING FOODS

Nearly all mothers acknowledged the practice of giving water to their infants from the first week of life.

I give water to the child from birth, even before the baptism.⁶

Mother of a well-nourished 6-month-old girl, Boré (rural)

In my opinion, you give water once a day until he is two months old and then from time to time as he grows up.

Mother of a well-nourished 6-month-old girl, Sevaré (urban)

Water was seen as crucial to life and of particular importance to young infants.

⁶Baptisms usually occur on the seventh day of a child's life.

During the past 24 hours, she has only taken water because water is indispensable to survival.

Mother of a well-nourished 3-month-old girl, Sevaré (urban)

During the last 24 hours, I gave water because all human beings need water to survive.

Mother of a well-nourished 4-month-old infant, Sevaré (urban)

Giving complementary foods was seen as a sequential process beginning with *cobal*. Most mothers advocated giving *cobal* at about 6-7 months, with a small minority saying that it should be given earlier or later.

I know that at around 5 months you can get her to taste cobal little by little.

Mother of a well-nourished 8-month-old girl, Sevaré (urban)

At 6 months, you can give cobal and all liquids that are not salty.

Mother of a well-nourished 7-month-old boy, Sevaré (urban)

Some mothers looked for physical signs of development in their children as a signal for giving them complementary food.

I give him breast milk and the traditional medicines. I would not want him to have additional foods before he starts crawling.

Mother of a well-nourished 6-month-old boy, Boré (rural)

The main reason for giving *cobal* was that breast milk alone would no longer satiate the child and that the child was asking for additional food or crying after being breastfed. Again and again, the overriding idea was expressed that a child should be stopped from crying because it impedes women's work and agricultural activities.

Now the quantity of milk is not sufficient, and I noticed that after each period of breastfeeding, he was crying and I had to fill him up with cobal. Then he was calm.

Mother of a well-nourished 10-month-old boy, Mopti (urban)

I gave him cobal in addition to breast milk so that he could be at ease.

Mother of a well-nourished 10-month-old girl, Boré (rural)

Foods such as soured milk and *cobal* were described as being “sweet” (even though they may contain no sugar) and appropriate for young children. Regarding giving “heavier” foods such as *to* or rice, it was thought better to postpone these until the child had started to walk or had been completely weaned (whichever came first) because otherwise the child's legs would become “heavy” and he would have difficulty walking. This view seemed more widespread among the mothers of malnourished children.

Before weaning, if you give food to the child (besides cobal), he will walk with difficulty and his legs will become heavy.

Mother of a malnourished 7-month-old boy, Boré (rural)

I think that if you give food before weaning, he will risk having a lot of illnesses. Very often he will become heavy and not walk on time.

Mother of a malnourished 9-month-old boy, Mopti (urban)

In addition, among mothers in both groups, the idea that introducing solid foods would increase the amount the child defecates was extremely common. Given their heavy workloads, mothers attempted to control their child's defecation (often by giving enemas as described above). Some women expressed the view that solid food should be delayed to prevent excessive defecation, which would then have to be cleaned up.

It can lead to poor nutrition and even malnutrition among such children because the child will make too much feces. It tires out the mother.

Mother of a well-nourished 6-month-old girl, Sevaré (urban)

Giving additional foods to a child who is breastfeeding will result in a lot of feces so it is better to wait until he has grown.

Mother of a well-nourished 5-month-old boy, Sevaré (urban)

The idea that the child had to indicate that he or she required complementary food was extremely prevalent among the mothers of malnourished children. Only one mother of a well-nourished child expressed this view.

As soon as he starts to want to eat of his own volition, you have to give him food. The only criterion is when he starts to pull himself towards food.

Mother of a malnourished 12-month-old boy, Sevaré (urban)

One day the child wanted to eat rice and I gave him some. Since then, I have given him everything.

Mother of a malnourished 12-month-old girl, Mopti (urban)

First the breast milk becomes insufficient, and then the child seeks food other than breast milk.

Mother of a malnourished 11-month-old boy, Sevaré (urban)

Although these statements about how and when to give an infant food are instructive and fairly consistent, they do not reflect what mothers actually do. As can be seen below, both mothers' reports about how they care for their child and observations of the interaction between mother and child show a pattern of complementary feeding somewhat different from what mothers gave as

rules for action. The discrepancies involve both what was given and the time (age) it was given. For instance, although mothers stated that children should not be given *to* or rice until they can walk or until they are weaned, very few followed that “rule.”

Indeed, both the reported consumption data and the observations suggest that malnourished children in particular actually consume these foods considerably earlier than their mothers claim. Some mothers knew what they “ought” to do but admitted that they had acted differently by giving foods earlier than would have been expected. Giving food earlier than what women have been told is good may be a response to the child’s own behavior, in particular, in an attempt to quiet crying so that they could get on with their work.

Some people give food at 5 or 6 months. I give them food at 4 months.

Mother of a malnourished 9-month-old boy, Boré (rural)

Nine months is the best age, but for reasons that are related to the living conditions of the mother, some give at 3 months; I give at 6 months.

Mother of a well-nourished 3-month-old boy, Mopti (urban)

There also seems to be some flexibility in the definition of “food.” Women who were adamant that giving *to* or rice to children before weaning would delay development were happy to give *cobal*. *Cobal* is considered both an appropriate bridging substance before the introduction of “real” solids such as rice and *to* and a “top-up” food in cases of perceived milk insufficiency. It should be noted, however, that unless soured milk is added to it, *cobal* is of extremely low calorific value.

Furthermore, as shown above, traditional medicines were given virtually universally and even though these may contain shea or animal butter, they are not considered food. Thus, surveys of infant feeding may not be capturing the true extent of complementary feeding, given the differences in the criteria for what constitutes “food” for mothers compared with what constitutes “food” for researchers.

7.1 BREASTFEEDING

During the observation period, all the children were observed breastfeeding. As earlier indicated, observations were noted each minute for a total of 360 minutes (6 hours) per child. Table 7 indicates that among the well-nourished and malnourished children, there were differences in the time spent breastfeeding although they were not statistically significant. In a linear regression for each age group, it was found that among those age 3-4 months, well-nourished children breastfed on average for 19 minutes more than their malnourished counterparts. This result has borderline significance ($p=0.181$) but may be significant with a larger sample size. Among those age 5-6 months, well-nourished children breastfed for on average 11 minutes more than those who were malnourished. However, among those age 7 months or more, those who were well-nourished breastfeed for on average 10 minutes less than their malnourished counterparts.

Table 7: Mean number of minutes child spent breastfeeding during the six-hour observation period, by nutritional status and age

Age of child (months)	Well-nourished children (N=16)		Malnourished children (N=15)	
	No. mins	% time	No. mins	% time
3-4	61.3	17	42.3	12
5-6	41.8	12	30.3	8
7+	37.2	11	47.2	13

These data indicate that younger children of better nutritional status spend more of the early months breastfeeding but then appear to reduce breast milk consumption to take in additional liquids and solids by at least six months of age. Those who are malnourished seem to breastfeed less in the early months but more during the later months, compared with their well-nourished peers. It is impossible to say whether the shorter amount of breastfeeding in early life is a cause or consequence of their nutritional status without knowing the full medical and nutritional history of the children in question.

Factors leading to difficulties with feeding may include problems associated with congenital disorders or low birth weight about which we have no information. However, it may be that such conditions lead to problems with suckling and/or breast milk intake and later to a reluctance to take solid food at six months when their well-nourished counterparts are able to do so.

In summary, the general patterns indicate that at younger ages, those with better nutritional outcomes breastfed for a longer duration during the observation period. In contrast, at the older ages, those with poorer nutritional outcomes breastfed slightly longer during the period they were observed.

Further analysis indicated that the mean duration of each period of breastfeeding did not vary between the well-nourished and malnourished children observed. Among those age 3-4 and 5-6 months, each period of breastfeeding lasted approximately 6 minutes, while those age 7 months or more fed for approximately 7 minutes at a time. Thus, the hypothesis that well-nourished children would breastfeed longer than malnourished children (hypothesis 4, section 4.1) was not supported.

7.2 MOTHERS' REPORTS OF LIQUIDS AND SOLIDS CONSUMED

Mothers were asked to name everything that their infant had consumed since birth and to state when the child began to take it. The categories of interest were the following: water, *cobal*, animal milk, formula, and traditional medicines for the liquids; meat or fish for the solid proteins; *to* and rice for the starch staple; and fruit. All the infants 6 months old or younger had been given water early on, and most had often been given traditional medicines in the weeks after birth.

All children received breast milk except one child in Mopti whose mother had died. Nearly all children received water and traditional medicines from early ages. Indeed, not one infant was truly exclusively breastfed, although many of the younger infants did not receive "food" until they were 6 months old. Children were, in general, receiving *cobal* at about 6 months, and *to* or rice was introduced at about 9-10 months. However, a few children in the rural areas were receiving only *cobal*, breast milk, and traditional medicines at 11-12 months of age.⁷

7.3 OBSERVATIONS OF LIQUIDS AND SOLIDS CONSUMED

The observations over a total of six hours in a day showed that the children spent very little time consuming any kind of liquid. As seen in Table 8, 16 well-nourished and 15 malnourished children were observed. However, in general, the older children spent more time consuming both water and other liquids than the younger children. It is noteworthy that of the three children exhibiting good nutritional status at 3-4 months, only one consumed water during the observations, compared with two out of the three others of the same age. Of the five children in good health at age 4-5 months, only one consumed water during the observations, compared with one out of the three who were malnourished. Nevertheless, none of the differences in the consumption of water at the different ages by nutritional outcomes were statistically significant.

Even children age 7 months or older, who needed complementary feeding for optimal growth and development, only spent about 2 percent of their time consuming liquids other than breast milk and water. Further analysis indicated that on average those age 7 months or older spent approximately six minutes more than the youngest children consuming liquids. Those who were better nourished spent an extra minute per observation period consuming liquids, compared with their malnourished counterparts. Among those age 5-6 months and 7 months or more, there was no difference by nutritional status in their consumption of other liquids.

⁷It should be noted that the traditional medicines are usually given with butter from the shea nut, which may have some calorific value.

Table 8: Mean number of minutes child spent consuming water and other liquids during the six-hour observation period, by nutritional status and age

Age of child in months	Well-nourished children (N=16)		Malnourished children (N=15)	
	No. mins	% time	No. mins	% time
CONSUMED WATER				
3-4	1.0	0.3	2.3	0.6
5-6	2.6	0.7	2.7	0.8
7+	3.8	1.0	3.4	0.9
CONSUMED OTHER LIQUIDS				
3-4	0	0	1.6	0.4
5-6	4.2	1.2	1.3	0.4
7+	7.2	2.0	7.2	2.0

Overall, the results point to some compensation by the mothers of very young malnourished children who tend to give greater quantities of water and other liquids. This may be to counteract perceived inadequacies of their breast milk or to facilitate surrogate caretaking by leaving a child with a sibling or other babysitter. However, by 7 months, these differences seem to have disappeared and the children follow more or less the same additional liquid regime whatever their nutritional status. Nevertheless, the children who are malnourished at this age appear to be breastfed significantly more, whilst those who are well nourished consume greater quantities of solid mushy food (see below).

Although there may not be significant differences in the quantity of liquids consumed by well-nourished and malnourished children, important variations exist in the quality of their intake. The only liquid consumed by well-nourished children age 3-4 months was water (N=3). In contrast, those of the same age who were malnourished were consuming traditional medicines and *quinqueliba* (a local infusion with anti-pyretic and other healing properties). Giving traditional medicines and *quinqueliba* suggests that mothers or caretakers were aware of the weakened state of their child and were attempting to rectify it by administering local therapies.⁸

The small number of children age 5-6 months make generalization and comparison difficult: three were malnourished, and five were well nourished. For the 7- to 12-month-olds, gruel made up one-half of the liquid intake during the period they were observed. Unlike their malnourished counterparts, older children who were better nourished were also consuming cows' milk. It should be noted, however, that the gruel also sometimes contained soured milk. Malnourished children were thus likely to occasionally consume animal milk even though it was in a diluted form.

The amount of time spent consuming solid food by the 16 well-nourished and the 15 malnourished children was extremely minimal. Those in the youngest age groups did not consume any solids at all. However, even the older children who were capable of chewing and digesting solid food spent minimal time actually doing so. The observations found that a surprisingly high

⁸ Some traditional medicines are routinely given to healthy children to prevent illnesses such as diarrhea and to enhance growth (Castle, 1992). However, in this case, it was noted that the medicine was given for curative rather than preventive purposes.

proportion of the time spent consuming solids included the consumption of clay, earth, and/or sand. If these are added to the true solids (which can be classified as “food” and have a nutritive value), then the number of minutes spent consuming solids doubles to 5.7 for the malnourished children age 5-6 months. These figures indicate the malnourished children age 5-6 months spent twice as long eating clay or sand and actual food. In contrast, none of the well-nourished children of the same age were consuming such non-foods.

Geophagia (or the consumption of dirt or earth) among children has been reported in Africa and elsewhere. In Guinea, it was found that more than half of all children under age five routinely consumed dirt. The practice was strongly associated with subsequent parasitic infections (Glickman et al., 1999). In South Africa, geophagia was found to affect children from the age of 8 months onward (Taylor et al., 1999) and in Holland, it was noted to be linked to zinc and other mineral deficiencies (Van Wouve, 1995). In Mali, pregnant women have been observed deliberately eating dirt (which is also sold for this purpose in local markets). It is likely that in this group and among the infants, the practice is a biological response to anemia or other mineral deficiencies.

In addition, malnourished children were observed consuming millet husks, which have little nutritive value and are probably a source of contamination. The better nourished children consumed foods of a comparatively higher nutritional value such as rice and sauce, fish, or fresh fruits and vegetables.

A comparison of rural and urban children observed showed only slight differences in the type of food consumed. Interestingly the rural children age 4-5 months appeared to consume a greater variety of foods, but these foods were not always of high nutritional value. In contrast, the urban children of the same age appeared principally to consume fish and rice with sauce. By 7 months, both sets of children were consuming more or less the same items. It is important to note that both the 5- to 6-month-olds and the 7- to 12-month-olds in rural and urban areas were consuming both gruel and rice with sauce. This represents a contrast with both what was considered normative and what was reported by mothers. That is, the observations found far more complementary feeding at these ages than were found with other methods of data collection.

7.1 BREASTFEEDING

During the observation period, all the children were observed breastfeeding. As earlier indicated, observations were noted each minute for a total of 360 minutes (6 hours) per child. Table 7 indicates that among the well-nourished and malnourished children, there were differences in the time spent breastfeeding although they were not statistically significant. In a linear regression for each age group, it was found that among those age 3-4 months, well-nourished children breastfed on average for 19 minutes more than their malnourished counterparts. This result has borderline significance ($p=0.181$) but may be significant with a larger sample size. Among those age 5-6 months, well-nourished children breastfed for on average 11 minutes more than those who were malnourished. However, among those age 7 months or more, those who were well-nourished breastfeed for on average 10 minutes less than their malnourished counterparts.

Table 7: Mean number of minutes child spent breastfeeding during the six-hour observation period, by nutritional status and age

Age of child (months)	Well-nourished children (N=16)		Malnourished children (N=15)	
	No. mins	% time	No. mins	% time
3-4	61.3	17	42.3	12
5-6	41.8	12	30.3	8
7+	37.2	11	47.2	13

These data indicate that younger children of better nutritional status spend more of the early months breastfeeding but then appear to reduce breast milk consumption to take in additional liquids and solids by at least six months of age. Those who are malnourished seem to breastfeed less in the early months but more during the later months, compared with their well-nourished peers. It is impossible to say whether the shorter amount of breastfeeding in early life is a cause or consequence of their nutritional status without knowing the full medical and nutritional history of the children in question.

Factors leading to difficulties with feeding may include problems associated with congenital disorders or low birth weight about which we have no information. However, it may be that such conditions lead to problems with suckling and/or breast milk intake and later to a reluctance to take solid food at six months when their well-nourished counterparts are able to do so.

In summary, the general patterns indicate that at younger ages, those with better nutritional outcomes breastfed for a longer duration during the observation period. In contrast, at the older ages, those with poorer nutritional outcomes breastfed slightly longer during the period they were observed.

Further analysis indicated that the mean duration of each period of breastfeeding did not vary between the well-nourished and malnourished children observed. Among those age 3-4 and 5-6 months, each period of breastfeeding lasted approximately 6 minutes, while those age 7 months or more fed for approximately 7 minutes at a time. Thus, the hypothesis that well-nourished children would breastfeed longer than malnourished children (hypothesis 4, section 4.1) was not supported.

7.2 MOTHERS' REPORTS OF LIQUIDS AND SOLIDS CONSUMED

Mothers were asked to name everything that their infant had consumed since birth and to state when the child began to take it. The categories of interest were the following: water, *cobal*, animal milk, formula, and traditional medicines for the liquids; meat or fish for the solid proteins; *to* and rice for the starch staple; and fruit. All the infants 6 months old or younger had been given water early on, and most had often been given traditional medicines in the weeks after birth.

All children received breast milk except one child in Mopti whose mother had died. Nearly all children received water and traditional medicines from early ages. Indeed, not one infant was truly exclusively breastfed, although many of the younger infants did not receive "food" until they were 6 months old. Children were, in general, receiving *cobal* at about 6 months, and *to* or rice was introduced at about 9-10 months. However, a few children in the rural areas were receiving only *cobal*, breast milk, and traditional medicines at 11-12 months of age.⁷

7.3 OBSERVATIONS OF LIQUIDS AND SOLIDS CONSUMED

The observations over a total of six hours in a day showed that the children spent very little time consuming any kind of liquid. As seen in Table 8, 16 well-nourished and 15 malnourished children were observed. However, in general, the older children spent more time consuming both water and other liquids than the younger children. It is noteworthy that of the three children exhibiting good nutritional status at 3-4 months, only one consumed water during the observations, compared with two out of the three others of the same age. Of the five children in good health at age 4-5 months, only one consumed water during the observations, compared with one out of the three who were malnourished. Nevertheless, none of the differences in the consumption of water at the different ages by nutritional outcomes were statistically significant.

Even children age 7 months or older, who needed complementary feeding for optimal growth and development, only spent about 2 percent of their time consuming liquids other than breast milk and water. Further analysis indicated that on average those age 7 months or older spent approximately six minutes more than the youngest children consuming liquids. Those who were better nourished spent an extra minute per observation period consuming liquids, compared with their malnourished counterparts. Among those age 5-6 months and 7 months or more, there was no difference by nutritional status in their consumption of other liquids.

⁷It should be noted that the traditional medicines are usually given with butter from the shea nut, which may have some calorific value.

Table 8: Mean number of minutes child spent consuming water and other liquids during the six-hour observation period, by nutritional status and age

Age of child in months	Well-nourished children (N=16)		Malnourished children (N=15)	
	No. mins	% time	No. mins	% time
CONSUMED WATER				
3-4	1.0	0.3	2.3	0.6
5-6	2.6	0.7	2.7	0.8
7+	3.8	1.0	3.4	0.9
CONSUMED OTHER LIQUIDS				
3-4	0	0	1.6	0.4
5-6	4.2	1.2	1.3	0.4
7+	7.2	2.0	7.2	2.0

Overall, the results point to some compensation by the mothers of very young malnourished children who tend to give greater quantities of water and other liquids. This may be to counteract perceived inadequacies of their breast milk or to facilitate surrogate caretaking by leaving a child with a sibling or other babysitter. However, by 7 months, these differences seem to have disappeared and the children follow more or less the same additional liquid regime whatever their nutritional status. Nevertheless, the children who are malnourished at this age appear to be breastfed significantly more, whilst those who are well nourished consume greater quantities of solid mushy food (see below).

Although there may not be significant differences in the quantity of liquids consumed by well-nourished and malnourished children, important variations exist in the quality of their intake. The only liquid consumed by well-nourished children age 3-4 months was water (N=3). In contrast, those of the same age who were malnourished were consuming traditional medicines and *quinqueliba* (a local infusion with anti-pyretic and other healing properties). Giving traditional medicines and *quinqueliba* suggests that mothers or caretakers were aware of the weakened state of their child and were attempting to rectify it by administering local therapies.⁸

The small number of children age 5-6 months make generalization and comparison difficult: three were malnourished, and five were well nourished. For the 7- to 12-month-olds, gruel made up one-half of the liquid intake during the period they were observed. Unlike their malnourished counterparts, older children who were better nourished were also consuming cows' milk. It should be noted, however, that the gruel also sometimes contained soured milk. Malnourished children were thus likely to occasionally consume animal milk even though it was in a diluted form.

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proportion of the time spent consuming solids included the consumption of clay, earth, and/or sand. If these are added to the true solids (which can be classified as “food” and have a nutritive value), then the number of minutes spent consuming solids doubles to 5.7 for the malnourished children age 5-6 months. These figures indicate the malnourished children age 5-6 months spent twice as long eating clay or sand and actual food. In contrast, none of the well-nourished children of the same age were consuming such non-foods.

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In addition, malnourished children were observed consuming millet husks, which have little nutritive value and are probably a source of contamination. The better nourished children consumed foods of a comparatively higher nutritional value such as rice and sauce, fish, or fresh fruits and vegetables.

A comparison of rural and urban children observed showed only slight differences in the type of food consumed. Interestingly the rural children age 4-5 months appeared to consume a greater variety of foods, but these foods were not always of high nutritional value. In contrast, the urban children of the same age appeared principally to consume fish and rice with sauce. By 7 months, both sets of children were consuming more or less the same items. It is important to note that both the 5- to 6-month-olds and the 7- to 12-month-olds in rural and urban areas were consuming both gruel and rice with sauce. This represents a contrast with both what was considered normative and what was reported by mothers. That is, the observations found far more complementary feeding at these ages than were found with other methods of data collection.

8.1 INTERVIEWS WITH SURROGATE CARETAKERS

In the in-depth interviews, it became clear that women frequently employed surrogate caretakers when they were occupied with household tasks or engaged in cultivation or trading.

Generally, I get someone else to look after him when I go to the pump or above all when I go to the market.

Mother of a well-nourished 5-month-old boy, Sevaré (urban)

My mother-in-law looks after him constantly when I cook or when I pull water—generally when I am out of the house.

Mother of a well-nourished 9-month-old boy, Boré (rural)

Surrogate caretakers among the better nourished children were generally a woman's older daughter(s) or, in urban cases, unrelated co-renters, neighbors, or maids. More rarely, women's co-wives, co-resident sisters-in-law, or women's mothers were cited as surrogate caretakers.

In addition to me, it is her older sisters who look after her.

Mother of a well-nourished 9-month-old girl, Boré (rural)

Her sister and the mother of my friend who lives in the same compound regularly look after my child.

Mother of a well-nourished 9-month-old girl, Sevaré (urban)

The maid looks after her if I have to cook or if I have to go out.

Mother of a well-nourished 10-month-old girl, Mopti (urban)

Among the malnourished children, older female family members and, in particular, children's paternal grandmothers were cited as principal surrogate caretakers and were often responsible for complementary feeding. Women's own mothers often helped with child care if they lived close by.

In addition to me, it is my mother-in-law who looks after the child. She gives her food and traditional medicines.

Mother of a malnourished 9-month-old girl, Boré (rural)

Her grandmother carries her on her back. She gives her something to eat if I leave some cobal.

Mother of malnourished 11-month-old girl, Sevaré (urban)

My mother looks after the child if I am occupied with household tasks. I take my child to her house.

Mother of a malnourished 11-month-old boy, Sevaré (urban)

Paternal involvement seemed more forthcoming among the well-nourished children, with infants' fathers babysitting or actively caring for them when the mother was unavailable.

Because her father works, he can only help at the end of the day, so he looks after the child while I am cooking.

Mother of a well-nourished 8-month-old girl Sevaré (urban)

His father looks after him in addition to me. He feels that it is his duty.

Mother of a well-nourished 12-month-old boy, Sevaré (urban)

In contrast, among malnourished children in rural areas in particular, paternal involvement was minimal and construed as culturally unacceptable.

Here, in our community, fathers don't do anything to look after their children.

Mother of a malnourished 8-month-old girl, Boré (rural)

A pattern thus emerges among the mothers of the better nourished children in which their social relationship with the surrogate caretaker allows them to give the person in question directions on how to look after the child and to correct them if the quality of care was not to their liking. As described, their surrogate caretakers are often their other children, or their nieces or maids; that is, younger individuals who are beneath them in the age-based social hierarchy and over whom they can exert substantial social power.

Under my advice, the maid gives her the medicines. I have a maid who is very reliable. She looks after the child very well along with my little sister. The maid gives her things to eat, but she follows the advice I give about the quantity and methods of storage.

Mother of a well-nourished 3-month-old girl, Sevaré (urban)

A recurring theme among the mothers of malnourished children was that they appear to have little control over the way in which the surrogate caretaker looks after their child. In the cases of the youngest women, their mother-in-law sometimes took almost total control of the baby, leaving them simply to breastfeed.

People like my mother and my sister (look after the child). No, I can't tell them anything because they know about children better than me.

Mother of a malnourished 11-month-old boy, Mopti (urban)

My mother-in-law gives the child things to eat. I don't give her any advice. She knows about these things better than me.

Mother of a malnourished 12-month-old girl, Mopti (urban)

My mother-in-law and my sisters-in-law look after the child whether I am here or not.

Mother of a malnourished 10-month-old girl, Synda (rural)

8.2 OBSERVATIONS OF SURROGATE CARETAKERS

One can see significant differences in the type of care⁹ received by well-nourished and malnourished children in Table 9. Among the youngest and oldest infants, those who were well nourished received less direct maternal care. In contrast, the very young children who exhibited poor nutritional status were looked after by their mother throughout nearly the whole observation. Thus, the sick or unhealthy status of the malnourished children creates a climate of dependency among them that requires that their mother be constantly close to them. Alternatively, their poor health status may mean that they are less content or comfortable with surrogate caretakers and require intensive maternal care, including breastfeeding.

Caretaker	Children 3-4 months		Children 5-6 months		Children 7 months +	
	Well nourished	Malnourished	Well nourished	Malnourished	Well nourished	Malnourished
Mother	67	91	58	58	57	66
Older sibling	4	1	16	2	13	0
Father	0	0	3	1	7	5
Cousin	0	1	1	14	5	1
Aunt	3	1	8	12	6	10
Grandmother	6	4	7	11	5	11
Other	0	1	3	0	2	1
No one	20	1	5	2	6	5

This link emerged in a statement of a mother of a well-nourished child in Boré who noted that during her child's last illness:

She breastfed more than usual because she was really sticking around me. She played much less.

Mother of a well-nourished 10-month-old girl, Boré (rural)

⁹ "Care" was defined as a unit of observation during which an individual was actively intervening with the child (by playing or feeding for example) or was in a position to respond immediately to signs of distress or discomfort.

In addition, it was noticeable that the mothers of malnourished children often had no daughters who were of an age at which they could help with child care responsibilities. They lived in households where either the older children were boys or where no other surrogate caretakers existed. In this situation, they could not call on other children for help with other household tasks, so care of the child in question had to be combined with other domestic or field duties. It is possible that this combination of tasks may have compromised the quantity and quality of direct maternal care. Among all children, the difference in the amount of time spent in maternal or non-maternal care by nutritional status was statistically significant ($p < 0.001$) at a high level. This result thus contradicts the second study hypothesis outlined above, which suggests that children looked after by surrogate caretakers are likely to be malnourished.

Further analyzes showed that better nourished children at the younger ages were more likely to be left alone because they had a sense of security and well-being and did not mind being left by themselves. As seen earlier, the proportion of observation time these children were left alone, by nutritional status, was statistically significant ($p < 0.05$).

This table shows that those with better nutritional status spent a greater proportion of time in the care of their elder siblings (usually sisters), whilst those with poor nutritional status spent a greater amount of time with grandmothers and aunts. However, neither of these differences were statistically significant in the regression analyzes. It is primarily younger women who rely on aunts and grandmothers for child care; they are too young to have teenage daughters, and they are considered too young to know what is best for a child. If there is a trend here, it is most likely linked to the age of the mother.

Just as emerged from the women's verbatim statements, the observations found that fathers played a small but important role in looking after the healthier children when compared with those who were malnourished. The better nourished infants also had access to care from their fathers as well as from their older siblings.

8.3 MOTHERS' AND CHILDREN'S ACTIVITIES

As in most African societies, children are carried on the mother's (or other caretaker's) back, usually until weaning. Thus, the mother can carry out additional tasks whilst looking after her child and pausing to breastfeed on demand. However, sleeping babies may be placed on the ground in the wrap-around used to tie them on the mother since constantly carrying a child does make the mother's task (such as pounding millet or cultivating) rather arduous. This practice means that children are moved around considerably and found in many different locations.

The observations found some striking differences in the location of the well-nourished and malnourished children during the observation time (see Table 10). Well-nourished children at the younger ages spent considerably more time in their own homes than did those who exhibited poorer nutritional status. The latter were more likely to be found in the village (for example, while the mother fetched water or condiments), in the field (while she cultivated), or at the market (while she conducted petty trading).

Most probably, these findings stem from two relationships. First, malnourished children are likely to be more clinging or demanding and require constant maternal attention, making it difficult to leave them behind. Second, these women often lack surrogate caretakers at home in the form of older daughters and are obliged to have their infant accompany them when they work. Differences

in the proportion of observation time that well-nourished and malnourished infants spent in and outside their homes was statistically significant at a high level ($p < 0.001$).

Table 10: Location of child during observation (percentage), by nutritional status and age						
Caretaker	Children 3-4 months		Children 5-6 months		Children 7 months +	
	Well nourished	Malnourished	Well nourished	Malnourished	Well nourished	Malnourished
Own home	90	26	98	71	81	80
Neighbor's home	1	3	1	3	3	6
Village	9	16	1	14	16	14
Field	0	30	0	11	0	0
Bush	0	2	0	0	0	0
Market	0	22	0	2	0	0

The observations indicate that there is no fundamental difference in the amount of time spent directly caring for the child (for example, playing, comforting, feeding) between the mothers of well-nourished and malnourished children. However, if only playing is considered, both sets of mothers spent an average of 1 percent of the observation time playing with their children. Thus, hypothesis 1, which suggested that the mothers of well-nourished children interacted with them more intensively, was not supported.

The mothers of malnourished children participated slightly more in social activities, but those of well-nourished children appeared to rest or relax alone for a greater proportion of the observation time. The mothers of the youngest well-nourished children were engaged in household tasks for a considerably longer period when compared with the mothers of the youngest malnourished children. However, the opposite trend was evident for older infants (who are likely to be more demanding and indeed heavier to carry around) because the mothers of malnourished children engaged in household tasks for a significantly longer percentage of the observation time than the mothers of well-nourished children. Mothers of malnourished children also spent more time cultivating fields.

Considering all children together, the mothers of malnourished children spent 25 minutes more engaged in household labor than the mothers of the well-nourished children did during the six-hour observation period. Regression analyzes indicated that this difference was statistically significant ($p < 0.01$).

The observations did not discover any systematic differences in the activities of the well-nourished and malnourished children. Among the youngest children, those who were better nourished, breastfed, cried, and sat for a slightly longer time during the observation period. Interestingly, the malnourished children were attached to their mother's back for a longer duration at every age. This may indicate that the mother was engaging in household labor and, lacking social support, saw it as the most efficient way of looking after the child while continuing to work. In a regression analysis, the difference in the amount of time the well-nourished and malnourished children spent on their mother's back was statistically significant ($p < 0.05$), with the latter spending 25 minutes more on their mother's back during the six-hour observation.

8.4 MANAGEMENT OF ILLNESS

Very little difference was found in the kinds of illnesses experienced by the two groups of children according to mothers' reports. A higher percentage of the mothers of the malnourished children (43 percent) reported that the child had experienced diarrhea as the last illness, compared with 23 percent of the mothers of the well-nourished children. However, 6 of the 33 well-nourished children were reported never to have been sick, compared with none of the 37 who were malnourished.

Table 11 shows the frequencies of last illnesses reported by the mothers of well-nourished and malnourished children.

Table 11: Last illnesses reported by mothers of well-nourished and malnourished children		
Illness	Well nourished (N=33)	Malnourished (N=37)
Diarrhea	9	16
Fever/malaria	11	11
Teething	2	1
Skin problems (rash, boils)	1	3
Conjunctivitis	1	1
Cold	5	1
General aches and pains	2	-
Congenital (low birth weight)	-	1
Lack of traditional preventive medicine	-	1
Don't know	2	2
Never been ill	6	0

Regarding breastfeeding and giving water during the last illness, no differences in maternal behavior were evident among the two groups. Twenty-seven percent (9 of 33) of the mothers of well-nourished children said that they breastfed more during the illness episode, compared with 22 percent (8 of 37) of the mothers of malnourished children. Nearly half of each group said that they breastfed less because the child was lethargic or too weak to suckle.

During the illness, I breastfed less because the child was refusing everything. I am telling you that she even refused water, which explains why she is so thin.

Mother of a malnourished 10-month-old girl, Synda (rural)

During the illness, she breastfed less because she did not have any appetite. She drank a lot of water because of her fever.

Mother of a well-nourished 6-month-old girl, Boré (rural)

Some mothers of the better nourished children persisted with breastfeeding during illness even when the child was reluctant. These mothers noted that breast milk was the child's only source of nourishment and that the child needed to consume it to facilitate recovery.

I breastfed a lot more during the illness because she could not eat anything else.

Mother of a well-nourished 9-month-old girl, Synda (rural)

During the illness, I breastfed more so that the child would not lose weight.

Mother of a well-nourished 3-month-old girl, Synda (rural)

The data show that similar proportions of mothers gave their children more water when they were sick. If diarrheal illness is considered separately from other illnesses, then five mothers of malnourished children reported giving less water and ten mothers reported giving more water when compared with one and four mothers of the well-nourished children, respectively. The quantity of water was generally increased first to replace the breast milk that was not being consumed and second to reduce fever and heat from the body.

I gave him water to drink at very regular intervals because he needed it. He couldn't breastfeed normally.

Mother of a malnourished 12-month-old boy, Synda (rural)

I gave her water all the time to avoid her mouth becoming dry and to try to lower the fever.

Mother of a well-nourished 11-month-old girl, Synda (rural)

I gave him more water because his throat was always dry and he was hot.

Mother of a well-nourished 12-month-old boy, Synda (rural)

Thus, in answer to the fourth research question presented earlier, it can be concluded that mothers' behavior during the reported illnesses, including diarrheal disease, was usually appropriate in that breastfeeding was generally increased as well as giving water.

8.5 TREATING ILLNESS

All the mothers except two treated the illness with traditional curative medicines, with only a handful giving allopathic medicines in addition.

The illness was situated in his stomach . . . I put the traditional medicines in a calabash containing water for about six hours, and during this time, I made him drink the medicines and I washed him with them.

Mother of a well-nourished 8-month-old boy, Synda (rural)

Mothers of malnourished children were often given advice by their mother-in-law or older women who often administered the treatment themselves.

It is an illness that makes the fontanel dance all the time . . . My mother-in-law treated it with shea nut butter and potash.

Mother of a well-nourished 6-month-old boy, Synda (rural)

Two mothers of malnourished children did not treat their infants, citing a lack of means. One gave up after finding a long line at the health center.

I took him to the doctor yesterday, but there were a lot of people. He didn't stop crying, so I took him home before seeing a doctor. Today, the dispensary is closed, so I will go on Monday.

Mother of a well-nourished 12-month-old boy, Sevaré (urban)

It is worth noting that mothers of well-nourished children were also more proactive in terms of illness prevention, speaking without prompting not only about the importance of hygiene but also of vaccination.

To look after a child properly, a mother must care for him correctly by washing him, clothing him, breastfeeding him, and following up on his appointments for immunizations.

Mother of a well-nourished 5-month-old boy, Sevaré (urban)

8.6 FEEDING DURING ILLNESS

Among those children already receiving complementary foods before their illness, eight mothers of well-nourished children made their children a special dish to aid their recovery. Only one mother of a malnourished child did so. The dishes included fish soup, eggs, milk, and gruel and probably contributed substantially to the children's nutritional intake.

I made him omelettes so that he would have a lot of strength to be able to fight off the illness.

Mother of a well-nourished 7-month-old boy, Boré (rural)

I gave him butter—butter gives health and eliminates a yellow matter that people with “kefi” vomit up.

Mother of a well-nourished 6-month-old boy, Mopti (urban)

Generally, and not just when their children were sick, mothers of malnourished infants did not encourage them to eat if they did not want to. Elsewhere in Mali, it is commonly thought that a child who refuses food should not be forced to eat (Dettwyler, 1986; Castle, 1992).

If she refuses, I just leave it because this means that she is not hungry.

Mother of a malnourished 9-month-old girl, Boré (rural)

When she refuses, I put her on my back and continue working.

Mother of a malnourished 8-month-old girl, Boré (rural)

If he refuses, I just leave it until he decides he wants to eat.

Mother of a malnourished 8-month-old boy, Mopti (urban)

In contrast, the mothers of the well-nourished children were more proactive and encouraged their infants to eat even when they appeared not to be hungry.

If he refuses, then I sing to him; I take him in my arms. Afterwards, he will eat.

Mother of a well-nourished 10-month-old boy, Synda (rural)

If she refuses to take in food, I try and encourage her to eat by coaxing her.

Mother of a well-nourished 11-month-old girl, Synda (rural)

8.7 SOCIAL SUPPORT OPTIONS

Decisions about feeding and other issues related to child care are embedded in the social networks in which the mother is involved. The choices a mother makes about the time she devotes to her child or to other household activities are often governed by the availability of social support in her home or community. It became clear throughout the study that infant feeding and other aspects of child care are fundamentally linked to the social context in which they occur. Mothers with weak social ties or low social support may have difficulties in fulfilling their multiple roles as mothers, daughters-in-law, and spouses.

Elsewhere in both the developed and developing world, studies have indicated that mothers with poor social networks and social ties are associated with poor child nutritional status (Zeitlin et al., 1990; Myntti, 1993). The lack of practical and emotional support available to the mothers of malnourished children in particular emerged from the in-depth interviews in this study and may be a key contributing factor to their children's poor health outcomes.

I am alone here with my husband, who spends all his time in the fields . . . I have nobody here at home. Sometimes my neighbors help me . . . I suppose they do their best, but they are only neighbors. I have no one to whom I can give my child except the neighbors and that's just for a short while anyway.

Mother of a malnourished 7-month-old boy, Boré (rural)

I have no one who can help except for my husband's sister . . . The others are never around.

Adoptive mother of a malnourished 11-month-old boy, Mopti (urban)

No one helps me because my sister isn't here and my mother is always ill.

Mother of a malnourished 4-month-old boy, Synda (rural)

In contrast, mothers of well-nourished children cited numerous people they could call on for assistance.

Toumani is in better health than other children because we look after him very well. He is well treated. (When he was ill) it was only then that I realized how much affection everyone had for him. Everybody was watching over him.

Mother of a well-nourished 4-month-old boy, Sevaré (urban)

Literature from elsewhere in the developing world has noted the phenomenon of death clustering (Ronsmans, 1995; Zaba and David, 1996) whereby much of the mortality in a community is accounted for by a small minority of families. For example, in India, it was found that 12 percent of families accounted for more than 60 percent of the mortality in specific communities (Das Gupta, 1997). The mothers of malnourished children in Mali often appear to exhibit characteristics found among the malnourished children in those studies. That is, they are not proactive, do not closely monitor their children's health and growth, and often have low social support.

Furthermore, the mothers themselves often exhibit poor health outcomes. The mothers of the malnourished children were often not in good health themselves and often lacked the resources to seek appropriate treatment. Their own ill health is likely to have compromised the quality of care they were able to give their children and increased their reliance on surrogate caretakers.

My mother and my husband's sisters look after the child. Since I got married, I have not been in good health. That's the main problem—I am always ill.

Mother of a malnourished 12-month-old girl, Sevaré (urban)

The phenomenon of clustering also meant that these women were likely to have lost more than one child, resulting in reduced availability of older sisters as surrogate caregivers.

I come from Libe, a village in Burkina Faso. When I got married, I lost each one of my pregnancies. I came to Soukoua here with my husband to get treated by the marabouts (religious clerics). After the treatment, we came to Mopti and never moved.

Mother of a malnourished 11-month-old boy, Mopti (urban)

During most of the day, the child is with me because his older sister who used to look after him just died.

Mother of a malnourished 3-month-old boy, Synda (rural)

9.1 GRANDMOTHERS

The group discussions with the grandmothers in Boré and Sevaré suggested that the familial context of decisionmaking about giving infants complementary foods may be changing over time. First, the older women emphasized that the mother and paternal grandmother of a child had very different roles and responsibilities. In general, they appeared to believe that the latter should play a more active part in the child's upbringing and that the mother's main job was to breastfeed.

The mother breastfeeds; she puts the child on her back. The grandmother washes the child and prepares traditional medicines.

Group discussion, grandmothers, Boré (rural)

The grandmother looks after the child. The mother breastfeeds.

Group discussion, grandmothers, Boré (rural)

In the morning, we wash them (the children), we cure their illnesses, and we feed them with whatever we have for the family meal and cobal.

Group discussion, grandmothers, Boré (rural)

This supportive or even replacement role was seen as more important for first-time or inexperienced mothers.

The grandmother can notice things that the mother doesn't know about, especially if it is her first pregnancy. It's the grandmothers who know how to give good advice to the mother.

Group discussion, grandmothers, Sevaré (urban)

The belief that giving complementary food too early would impede a child's walking and general development was strongly expressed by the grandmothers in both settings. However, the grandmothers thought that children today were being given additional food and liquids much earlier than when they had raised their own children.

Before, we only gave food when the child himself took it and put it in his mouth. Today, however, things have changed. Mothers even give complementary food at one month now.

Group discussion, grandmothers, Boré (rural)

Things have changed now; they (the mothers) give food to children too early.

Group discussion, grandmothers, Boré (rural)

Although some remained unconvinced that earlier supplementation may be beneficial, a minority had come to accept that giving extra food at early ages actually did no harm.

Now we realize that giving food earlier doesn't have any harmful effect.

Group discussion, grandmothers, Sevaré (urban)

In many cases, it was revealed that the grandmothers decide when complementary feeding should occur.

It is the grandmother who tells the mother when to give other food. If the mother respects her mother-in-law, she will let her take the initiative.

Group discussion, grandmothers, Sevaré (urban)

There are mothers who take the initiative, but in general, if the grandmother is present, it is her role.

Group discussion, grandmothers, Sevaré (urban)

However, with increasing numbers of younger women receiving education, their automatic subjugation to the will of the mother-in-law in this matter appeared to be declining.

You see, things are not the same. The mothers do not respect the traditions. They give food too early. In our time, we gave food when the child moved himself toward the serving dish.

Group discussion, grandmothers, Boré (rural)

Before, grandmothers decided the timing of weaning, but today mothers do things of their own will.

Group discussion, grandmothers, Boré (rural)

Concerning other matters of infant well-being, grandmothers' social power appeared to be declining as younger women were exposed to messages about child health and hygiene either through schooling or from nongovernmental organization (NGO) activities.

The mothers don't like it if we give the children pond water, but for us, it is the best.

Group discussion, grandmothers, Boré (rural)

It is views about traditional and modern medicines that separate us.

Group discussion, grandmothers, Sevaré (urban)

Thus, although grandmothers seem to generally still hold the view that supplementation at later ages is best, their impression is that things are changing and that they are less able to impose their will on their daughters-in-law. However, among mothers who were interviewed who had no other sources of information except their mother-in-law, the practice of late supplementation was reinforced by the advice given by the older women. The need is therefore for more and correct information about supplementation to be accessible in these communities. In addition, older women must be included in any awareness-raising activities about child health because of their enormous influence on the way in which children are brought up.

9.2 FATHERS

One of the main themes to emerge from the group discussions with fathers of infants age 3-12 months was the difficulty they had in supporting their family economically. Men saw themselves as the linchpin of their family, responsible for decisionmaking affecting the well-being of their wife and children, particularly when it came to food.

The man is incontestably the pivot of the family. Everything comes from him.

Group discussion, fathers, Sevaré (urban)

The man should do everything so that he can give food of a good quality to his wife so that the child will be well nourished.

Group discussion, fathers, Boré (rural)

I think that in a family, the woman and the child are all the children of the man. The man should find the means to feed the woman who is breastfeeding his child. The man should also see that they are in good health by buying them (modern) medicines.

Group discussion, fathers, Boré (rural)

People have the custom of saying that the man is a lion in the bush and in the home. A father should be able to give everything that is necessary to the woman and assume certain responsibilities.

Group discussion, fathers, Sevaré (urban)

The importance of using modern medicines and vaccinating children was mentioned much more by the fathers, particularly in urban areas, when compared with the women. They saw their role as one of supervising and authorising contact with the modern medical establishment.

Looking after the child is the task of the mother who should inform the father if the child is sick. He, in turn, should authorize the woman to take the child to the hospital and pay for any prescriptions.

Group discussion, fathers, Sevaré (urban)

If the doctors say that the child should be brought for immunization, then the father should see that the child is vaccinated.

Group discussion, fathers, Sevaré (urban)

The provision of food and medical needs for the family by the father alone appeared to be becoming increasingly hard. Men expressed the view that some of them were not always able to look after their family as they would wish.

The bringing up of children is a task shared by both parents but to different degrees. The child and his mother are under the responsibility of the father. So if the father does not have sufficient resources, they will live in difficult circumstances, and then things become socially very unstable.

Group discussion, fathers, Sevaré (urban)

What you need to do is to give a variety of foods to the woman so she can feed the child. This is not possible in all families. The whole problem is one of economic means; if not, there would never even be any need for a discussion about this subject.

Group discussion, fathers, Sevaré (urban)

Some fathers saw themselves as key advisors on the timing of giving complementary food despite the fact that their role appeared to be minimal according to the testimonies of the women interviewed.

I trust my own advice because I have quite a lot of children, and I have a lot of experience in the subject.

Group discussion, fathers, Boré (rural)

The opinion of the father is a priority because he is responsible for the family. They have to be accountable to him about everything.

Group discussion, fathers, Sevaré (urban)

However, most men preferred that their wives sought advice from older women, while a minority expressed the opinion that health workers may be able to give appropriate information.

In my opinion, the point is that the child's paternal grandmother (should give advice) as she has more experience in the subject.

Group discussion, fathers, Boré (rural)

This aspect (complementary feeding) is often controlled by old women.

Group discussion, fathers, Sevaré (urban)

Old women play an important role in this domain.

Group discussion, fathers, Sevaré (urban)

I think that the health center is the best place to get information (on complementary feeding) because they are the best informed on this subject.

Group discussion, fathers, Boré (rural).

Opinions about the best age for supplementation varied among the men interviewed in the focus group between 4 months and 12 months, with the majority preferring to start giving food at about 6 months of age.

At six months, I give additional foods but in moderation. If you give too much, the child will have problems with digestion.

Group discussion, fathers, Sevaré (urban)

I think that you should wait until 6 months to start additional feeding, and this will help with weaning because the child will eat, and gradually he will forget the breast—something which will suit the mother. But below this age, it will hold back the child's growth.

Group discussion, fathers, Boré (rural)

Those who preferred to wait expressed the view commonly held by the older women and those of reproductive age, that giving food before 12 months would stop the child from walking.

I think you should wait until 12 months before giving other foods like fruits, vegetables, little light things. But you should note as well that breast milk is bitter—it is a good medicine—so the child should take only breast milk for 12 months. Before this age, these foods will make the child lazy, and he will walk late.

Group discussion, fathers, Boré (rural)

The final theme to emerge from the discussion with the men was their awareness of the need to support their wife both physically and emotionally so that she can raise the child in the best possible circumstances.

The man should have pity for the woman (to enhance) the well-being of the child. She should eat well and avoid certain work that may lower the quality of her breast milk. So you should support her physically and even morally to ensure the successful breastfeeding of the child.

Group, fathers discussion, Sevaré (urban)

On this point, people always forget one thing—the heaviness of the tasks that this poor woman has to carry out. She is everywhere: in the market, in the kitchen, at the well, doing petty trading. It's too much for one person. If you add a child to that, she can only do her best. It is up to the man to help her when he is around with issues to do with the bringing up of the child and its feeding.

Group discussion, fathers, Boré (rural)

9.3 ADOLESCENT CARETAKERS

The group discussions with adolescent surrogate caretakers did not yield as rich information as those carried out with older women and men. This may be because, in this society, social relations are embedded in age-based hierarchies and the fact that the two women interviewers were slightly older (they were in their early 20s) rendered the girls shy and reticent. However, some interesting themes do emerge from the discussions.

The discussions revealed that the girls spent an enormous amount of time looking after their younger brothers and sisters in place of their mothers. They took care of the children when the mother was otherwise occupied and, in the urban setting, when they themselves were not at school.

I look after him when my mother is absent or when she works.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

(I look after the child) when our mother goes to the market or on the weekend when I do not go to school.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

Even when she (the mother) is not working, I look after him.

Group discussion, adolescent surrogate caretakers, Boré (rural)

Their responsibilities involved closely watching the children, washing them, feeding them, and ensuring their hygiene and safety.

I give him goat's milk; I wash him.

Group discussion, adolescent surrogate caretakers, Boré (rural)

I give him things to eat; I wash him and carry him on my back.

Group discussion, adolescent surrogate caretakers, Boré (rural)

I watch him closely to see that he does not go outside because there are cars in the street.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

They tell us to watch over him and to give him food when he is hungry.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

Most of all, however, their role was to entertain the children and to play with them. This, in their opinion, made the children very attached to them; in some cases, they felt that the children were happier with them than they were with their mother because they had more time to stimulate and interact with the infants.

The child is more at ease with me because he comes close to me more than he does with his mother. I play with him a lot.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

He feels more at ease with me because I play with him more—something his mother does not do.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

He feels better with me because I can walk him around, but with his mother, this is not the case.

Group discussion, adolescent surrogate caretakers, Boré (rural)

Feeding their younger brothers and sisters was one of the primary responsibilities of the adolescent surrogate caretakers. They held views similar to those of the women interviewed concerning the idea that giving a child complementary food early would compromise rather than promote growth. However, among the urban girls, the development milestone they cited for giving complementary food was that the child should be able to sit, which usually occurs at around six months of age. Mothers, in contrast, frequently said that the child had to be able to walk, which occurs between 10 and 12 months in most children and is far later than the age recommended by the international guidelines discussed above.

The best moment (to give complementary food) is to wait until he can sit up so that he does not fall ill.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

Wait until a certain stage of development in the child (so that he can sit up by himself). If you give it (food) before this, it will slow down his growth. After this age, he will need it (food); he will be hungry.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

Thus, some of the urban surrogate carers held views on the timing of giving food that are close to current public health recommendations. The rural girls, in contrast, held views similar to those of many mothers who said that complementary food needed to be delayed because otherwise, the child would not grow properly.

One year and five months (is the best age to supplement). Otherwise, the child's growth is slowed down and the child will become greedy. After this age, it does him no harm.

Group discussion, adolescent surrogate caretakers, Boré (rural)

Concerning the foods actually appropriate for small children, the adolescent caretakers expressed views similar to those of the women of reproductive age. The lack of variety of available foods means that there is actually very little choice in what can be given, and this, together with the time constraints associated with preparing different dishes, makes it unlikely that children and adults would eat different dishes. Thus, the discussions revealed that the girls thought that most of what adults consumed could also be consumed by children.

Everything that an older person eats, he can eat—to, rice, cobal—so that he has good health.

Group discussion, adolescent surrogate caretakers, Sevaré (urban)

The food most commonly cited as being appropriate for small children was *cobal* because it was considered to be light. Heavier foods such as *to* and rice were to be avoided, said some respondents.

Cobal is recommended as it does not weigh down a child.

Group discussion, adolescent surrogate caretakers, Boré (rural)

You should avoid giving rice and to as it is heavy.

Group discussion, adolescent surrogate caretakers, Boré (rural)

In urban areas, the adolescents spoke of artificial milk and Cerelac, an artificial weaning food made by Nestlé, which was associated with making the child strong and healthy.

(The best additional foods are) artificial milk, Cerelac, and potatoes so that he gets fatter.

Group discussion, adolescent surrogate caretakers, Boré (rural)

(The best additional foods are) breast milk and artificial milk and Cerelac so that he has more energy.

Group discussion, adolescent surrogate caretakers, Boré (rural)

Whatever their ideas about caretaking and infant feeding, adolescents play a major role in providing care for infants in each of the research sites.

CONCLUSIONS

10.1 AGE OF COMPLEMENTARY FEEDING

The interviews with mothers found a general consensus that solid foods should not be given to children until after the child can walk. However, this recommendation was often not followed, particularly by the mothers of malnourished children who regularly gave their children rice and *to* between 7 and 12 months of age. In addition, giving water and traditional medicines from birth is nearly universal. Introduction to complementary food was done using *cobal*, a watery millet-based gruel considered a bridging liquid appropriate for infants from about six months of age. It was described as “light” and “sweet,” classified differently from the staples such as *to* and rice, which were seen as heavy and which would “weigh the child down” and impede him from walking.

The problem with the wide use of *cobal* to complement breast milk is its nutritive quality is minimal unless it contains soured milk. Health education messages could emphasize the positive aspects of feeding at six months of age with *cobal* and reinforcing its energy content by adding groundnut oil, which is widely available, or pounded groundnuts, which are cheaper but still have a high calorific content.

Mothers of malnourished children tended to give their children complementary food earlier than mothers of well-nourished children because they perceived that their breast milk was insufficient or that the quality of the milk was inferior. They thus set up a cycle of breast milk insufficiency as the frequency and intensity of infant suckling was diminished by the child's consumption of complementary foods. Again, health education programs and health professionals need to carefully explain to women the relationship between infant suckling and milk production and insist that breastfeeding be increased rather than decreased if milk seems insufficient. In fact, health workers appear to sometimes need additional training in correct breastfeeding and supplementation practices, including advice about giving water. In some cases, water had been given in the first months of life on the advice of health professionals, when, in fact, this is not technically necessary and could be a source of contamination, potentially leading to diarrhea.

The observational data indicate that in general, in terms of feeding practices and food consumption, there were very few differences between the well-nourished and malnourished children, particularly at the older ages. There was some evidence that initial problems with growth and weight resulted in giving complementary food and in a decline in breastfeeding, but this was by no means a strategy for all the mothers interviewed. One important finding, albeit without statistical significance, was that the malnourished children were more likely to put dirt or sand in their mouth than their well-nourished counterparts. This points to issues of care and hygiene being fundamentally different between the two groups.

During episodes of illness, mothers tended to increase breastfeeding and giving water. Mothers of better nourished children paid more attention to food consumption if the child was sick and were more likely to prepare special dishes or to insist that a child ate even when he did not apparently wish to do so. Mothers of malnourished children expressed the view that if a child did not want to eat, there was no point in forcing him or her.

10.2 CONTEXT OF FEEDING PRACTICES

The study found that it is the context of the feeding practices and the decisions preceding them rather than the practices themselves that differ among the two groups of children. First, the community context is one of absolute and extreme poverty in which time and labor demands on women are excessive and result in very little income with which to purchase food or anything else. Men recognize that their responsibilities are to feed and cloth their immediate and often extended families, but they have great difficulty doing so. This is true throughout the rural areas and even in some urban households. In addition to the dry Sahelian environment, which precludes the cultivation of a wide variety of foodstuffs, this difficulty to meet basic daily food needs may explain why the differences in rural and urban feeding practices were minimal. Women admitted that despite advice from health workers to diversify complementary foods, they were unable to do so for economic reasons.

The data clearly indicate that one of the major determinants of mothers' ability to care for their children is the social support available to them in their household, and particularly with the availability of older daughters who can act as child minders. Those women who could not draw on daughters to provide child care for their infants, or to help with other household tasks were obliged to combine child care and domestic duties and carry out both simultaneously. Such double duty may well lead to increased fatigue and limit their ability to interact with their children. In particular, it may be that mothers are less able to monitor hygiene and cleanliness. Unminded children may place contaminating substances in their mouth leading to diarrhea and subsequent malnutrition. A cycle of apathy and dependency in children then begins resulting in their being less able to be left at home and more likely to accompany their mother on her back while she carries out her work.

The predominant finding related to the household context of decisionmaking about infant feeding was the importance of the role of the mother-in-law in all aspects of child care in households with young mothers. In particular, young and first-time mothers rarely made decisions alone about aspects of their children's well-being. Mothers-in-law took responsibility for much of the day-to-day care of the child, for giving traditional medicines, treating illnesses, and advising on complementary feeding. During the group discussions, older women stated that feeding with solid foods should be withheld until the child can walk; otherwise, his or her development will be impaired. However, they also recognized that, in many cases, feeding was occurring earlier than they would have liked.

In short, the preferences of other women for the timing of feeding were mixed. Nevertheless, their social power and child care roles cannot be underestimated. It is vital that the mother/mother-in-law dynamic be incorporated into education strategies and that the older women are sensitively informed of optimal feeding practices.

Overall, mothers' complementary feeding practices were different from the standards recommended by international agencies in two main ways: 1) nearly all mothers gave water and traditional medicines soon after birth and continued to do so, and 2) a large proportion waited to give solid foods (besides *cobal*) until the child was 9 or 10 months old. Although they recognized that the cultural norms prescribed withholding food until after the first year, they admitted that in fact they supplemented a great deal earlier with *cobal*, which was not considered "food."

Differences in the practices of mothers of malnourished children were not so evident for complementary feeding as for other aspects of care such as the choice of surrogate caretaker, attention to hygiene, and illness management. The interaction of these factors in this economically marginal environment characterized by food insecurity means that vulnerable infants easily run the risk of becoming malnourished, which often spirals into a constant cycle of illness, anorexia, and compromised growth.

10.3 POLICY RECOMMENDATIONS

- Health workers should be taught about the recommendations on exclusive breastfeeding and on the correct age for giving complementary foods, including water and traditional medicines. They also need to be trained to advise women to continue and even increase breastfeeding if their milk appears to be insufficient because milk production is related to the frequency and intensity of infant suckling.
- Because of their key role in child care with young mothers, older women (mothers-in-law) should be integrated into child health education programs, which often focus only on women of reproductive age. They could be sensitively educated by using “griots” (praise-singers) or other traditional methods of communication that emphasize their positive role and provide information about complementary foods.
- Opportunities for the development of women’s social support and social networks should be increased to provide them with opportunities for social interaction, economic collaboration, and child care. Recent migrants in urban areas could be linked to others from their place of origin through the “Associations des Ressortissants.” Neighborhood associations could be involved in setting up child care services for those who live in the same neighborhood.
- Since the main weaning food (*cobal*) is so widely given as a complementary food, it could be usefully fortified, perhaps with peanut oil or ground peanuts, to increase its energy content.
- Men should be encouraged to care for and interact with their children and taught about the correct ages for supplementation and the types of foods that are appropriate. This information could be disseminated during interventions that focus on agricultural improvements or during other male-orientated production activities.
- The association between good hygiene in the household and well-nourished status suggests that ways should be found to improve environmental sanitation around the household.

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